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CONTENTS

PART I.—AGRICULTURE IN 1954

	PAGE
Policy	1
Classification of African Lands into Land Use Categories	4
Weather	12
Food Production in African Areas	14
Agricultural Exports in 1954	15
Crops	19
Livestock Products	27

PART II.—RESEARCH AND SPECIALIST SERVICES

General Husbandry—

African Areas	32
European Areas	34
Grassland	35
Coffee	37
Pyrethrum	41
Sisal	42
Sugar	43
Horticulture	44
Plant Pathology	45
Entomology	45
Soil and Agricultural Chemistry	46
Plant Breeding and Selection	47

PART III.—FIELD SERVICES

Progress in Improved Farming—

European Areas	49
Asian Areas	50
African Areas	50
Reconditioning, Resettlement and Development Schemes	53

CONTENTS—(Contd.)

	PAGE
Soil and Water Conservation—	
Soil Conservation—Engineers' Headquarters	55
Soil Conservation—European Areas	56
Soil Conservation—African Areas	59
Water Conservation—Mechanical Dam Construction Units	61
Water Supplies—African Areas	64
Field Drainage	65
Irrigation	66
Agricultural Education—	
Egerton Agricultural College	66
African Areas	67
Agricultural Shows	69
Marketing—	
Produce Marketing and Inspection	69
Co-operation	70
Grading and Inspection Services, Mombasa	71

PART IV.—GENERAL

Library	73
Publications	73
Agricultural Legislation	74
Staff	75

TABLES

A.—Rainfall over the Main Agricultural Areas of Kenya, 1954	13
B.—Domestic Exports—Kenya, 1954	16
C.—Quantities and Values of Exports of Kenya Produce, 1954	28
D.—Quantities and Values of More Important Products Marketed from the African Areas	30
E.—Soil Conservation—European Areas	58
F.—Soil Conservation—Central and Southern Provinces	62

VOLUME I

DEPARTMENT OF AGRICULTURE ANNUAL REPORT, 1954

PART I—AGRICULTURE IN 1954

Policy

Emergency conditions continued throughout the year and the tension and strain under which our staff, European and African, had to work, particularly in the troubled areas of the Central Province, was very considerable. It is to their lasting credit that so much fortitude and determination were shown and that so much was achieved. Towards the close of the year there were encouraging signs that the initiative had been wrested from the *Mau Mau* gangs and that peace, law and order would once again prevail. Time will heal Kenya's wounds and with *Mau Mau* crushed, the young spirit of Kenya, given wise leadership, will go forward with added strength and a clearer vision.

It has not been possible to recruit the additional staff provided for in the Development and Swynnerton Plans at the rate and at the speed envisaged in these plans. Nevertheless, both the field and research staff have been strengthened, research facilities have been improved, houses built, and cash crop development greatly speeded up. The indications are, however, that staff of the quality we require will not be available at the rate necessary to implement our plans within the periods specified. A fuller statement on the staff position is given in the last section of this report. It seems probable too that marketing problems and other difficulties may prevent the realization of the phased cash crop production targets set in the Swynnerton Plan. The world's consumption of pyrethrum, for example, is very limited unless new markets and new uses can be established. Pineapples are a very promising crop in the Central Province with possibilities also in Nyanza, but we are dependent for expansion on finding a buyer for the fruit and on the buyer finding and establishing a market for the finished article. Our quality is good but there are many strong and established competitors in the same market. Sisal, to compete on the world's markets, must be properly prepared at all stages and a peasant industry based around a central factory depends on the whim of the peasant. When prices are low for sisal or when food is plentiful will he continue to produce and support his central factory? Sugar is being developed as a local peasant industry with its own local market. Pilot development of tea on Mount Kenya has been at a standstill due to the Emergency. Coffee development has presented no difficulties. These difficulties and problems were not unforeseen. They represent a challenge which has to be met. Marketing has been referred to as one of the under-developed areas in agricultural economic thinking. In highly developed countries price-fixing policy is changing as they recover from war-time shortages to one of flexible price supports rather than fixed supports. In Kenya where we are so largely dependent for our existence on agriculture the room for manœuvre is very small and it is inevitable that the policy of price fixing on the basis of cost of production plus a reasonable return to the farmer must be tempered by world markets and world demands. Our surplus production has to be exported and sold at the price the customer will pay and that price must influence the price which can be paid to the producer. Government cannot insulate farming against changing market requirements but it must do everything possible to ensure a fair return for efficient production and endeavour to give stability to the industry by avoiding reversals or sharp changes in policy. A policy of increased production regardless of price cannot be pursued. Greater efficiency in production must be the aim and what might be termed technical efficiency is not enough. Many farmers accept this and

realize that the objective should be sustained maximum net output from their farms. Hence the Department's farm planning service continues to gain in popularity and it is hoped soon to produce from actual planned farms, which have been in planned production for five or six years, an analysis which will show the financial advantage of this service to the individual and to the country.

When one revisits the United Kingdom and compares the farming outlook and farming talk with that of 20 or 30 years ago, one of the most striking of all changes is the serious business outlook of the farmer of to-day. One may think longingly of the more carefree and happy-go-lucky bygone days when rural communities worked hard but greatly enjoyed their simple leisure without what appear to be modern necessities such as cinemas, football matches, pools and television. To succeed in this modern farming world and to possess or enjoy modern amenities the farmer has been forced to regard his occupation as a business and to strive at every turn to make that business more efficient. The history of European farming in Kenya has been very similar but it is suggested that although we have and enjoy many modern amenities or contraptions, it is doubtful whether we have to anything like the same extent assumed that serious business outlook on farming. It seems not unlikely that less favourable times lie ahead and to meet such times serious thought must be given to improving the efficiency of production. All farm operations and practices should be suspect and should be reviewed to see where economies can be effected. Attention to detail, however irksome it may be, is essential if full efficiency is to be achieved. In our Departmental farm planning service we aim at effecting economies in many directions but with the best will in the world we will make mistakes, and in any case we can only hope to provide this service slowly over the years. It therefore falls to each and every farmer to examine the working of his farm and for each and every operation to give thought to where and how economies can be made, for it is he alone who will decide his production policy and what best suits his farm—and his pocket. The work which has been done in the Central Province merits special mention. It is not an exaggeration to say that the face of the country has been completely changed over the past two years. To a considerable extent we have the Emergency to thank for this. It has been possible to get the people to do what we know is good for them and for the land. Bench terracing on all the steeper slopes is a striking feature; on the very steep slopes, many of which were red scars on the countryside, paddocking (without gates) is general and the grass recovery is so remarkable that controlled entry of stock to the paddocks is now being permitted. Bench terracing, which is generally done by topographical units (but also on an individual basis) is undoubtedly the only practical answer to erosion control. It brings its problems with it, of which mention may be made of maintenance, the build-up of fertility, utilization by livestock and flood water disposal. When the Emergency is over and the inevitable tendency to relax sets in, Government must insist that this valuable basic framework is not allowed to fall into disrepair. Natural drainage ways must be preserved and protected, farm planning and reallocation of land to conform with efficient land use must be fostered and supported by every means. Another new feature in many locations is "villagization". This policy has obvious disadvantages from the agricultural viewpoint. In this type of country where ridge follows ridge it pains the agriculturist to see some of the best flat agricultural land on the top of ridges occupied by these mushroom towns. Livestock are also villagized just when our efforts to induce people to build decent cattle sheds and make manure were meeting with success, and many have died as a result. The Kikuyu land needs and responds well to farmyard manure. When the Emergency is over and security precautions can be reduced it is hoped that the genuine farmers will return with their stock to live on their own farm, leaving the villages for artisans, casual labour, shops and social amenities.

Later in this report mention is made of various irrigation schemes and that we have had the benefit of advice on these schemes from Mr. F. A. Brown, lately Manager of the Sudan Gezira Board, and of Mr. G. Lacey, Adviser on Irrigation to the Secretary of State. The visits of these experts were most welcome and their reports invaluable. It was encouraging to find that provided the necessary caution was exercised they pronounced not unfavourably on all schemes. They advocated the necessary investigation and pilot stages before full development was proceeded with. They emphasized the need for the most careful selection of settlers when the time arrived, the need for the strictest discipline of the settlers and warned us most strongly against regarding the schemes as "a dumping ground for the unemployed or for any except those who really want to till the land and make a living therefrom". They stressed the need for extinguishing any existing land rights within the commanded area and for vesting land rights in an appropriate body. Their recommendations will, it is hoped, be accepted by Government. It may be that for political or financial expediences the schemes will be rushed and orderly development telescoped. All the advice we have is that such a course would be courting disaster. We are inexperienced in irrigation and once a foot is set wrong it is not easy to put matters right. Provided we can obtain a nucleus of staff experienced in irrigation methods and provided we are given time and the necessary support, we feel that technically we can make a success of the schemes. We do not anticipate that the schemes will quickly fill up with suitable tenants. There will be no gold rush. If, for example, the Kikuyu decide to boycott the Mwea-Tebere scheme, and this is not outside the bounds of possibility, they will surely alienate the sympathy they have gained in some quarters with their continual cry for more land.

In our aim to raise and improve the standard of living of the African possibly the greatest obstacle we have to overcome is not a technical or even an administrative one, but the human one of obtaining response in terms of increased effort from the African. It is frequently stated that if it can be proved to the African that a certain aid or practice pays, he will adopt the aid or practice. It is quite wrong to assume that this is so. It is even further away from reality to assume that if in fact he adopts the improved practice his output and therefore his gross income will be correspondingly increased. There is the well-known story of the African farmer who when shown on his own farm that phosphates had doubled his normal yield, said how pleased he was with this new aid as he would need to plant only half his usual acreage next year. Many instances can be quoted, particularly during war-time conditions where efforts to obtain increased production by raising prices resulted in fact in a decrease in production. This old stumbling block made itself very evident when plans were being considered for the development of the various irrigation settlement schemes. Experienced officers were of the opinion that the average family would be unable to manage more than two or three acres of irrigated land and of course with the possible crops under consideration, the gross income was nowhere near our target of the family's food supply and a cash income of £100 per annum. It is also a most important factor in considering the statement made in the next section of this report on the classification of African areas into land-use categories. Much time, thought and work has been put into the framing of this land-use plan. Will the will and the effort required to implement it be forthcoming from the people it is designed to assist? What is the answer? High-priced cash crops, mechanization, group farming or what? I believe the realistic answer is that we must first engender

a desire in the African himself for a higher and better standard of living, a desire that will activate the farmer and his family to greater effort and greater output, of which they are undoubtedly capable. If he is to better his lot, we can show him the way but only by the labour of his hands and sweat of his brow can he reach that goal. There is nothing new in this suggestion, but it is such a simple fact that it is often overlooked by those who press for rapid progress in African development. How can this desire be created? Bicycles, gramophones, sewing machines, wheel-barrow, shops? They all help but it is doubtful whether they lead to sustained increased effort. In many areas, once bodily needs have been satisfied, and these are not elaborate, leisure is the most valued of all treasures. It is believed that the most promising focal point for attack is the woman and the home. It is the woman who must be educated to want a better home and a better life for her children. A man needs encouragement and pressure for sustained effort and the most potent driving force is woman. Women agricultural officers are unsatisfactory employees in many ways; they get married, they need escorts. African women agricultural instructors are employed in large numbers and they perform a most useful function in our approach to the true tillers of the soil, the women, but some more subtle approach, possibly through the medium of Women Social Welfare Workers seems desirable. This approach is being used to a limited extent but the aim merits the employment of selected, well-educated African women whose object should be to create in their particular parish a body of women who will not be content with their present lot.

There are, of course, exceptional individuals who want and strive for better things, but the above remarks apply to the vast majority of the African people and point the moral that however wishful we may be to bring about the rapid advancement of the African people it must and will be a slow and gradual process. On the other hand there are those who argue that if the African is happy with his full stomach and plenty of leisure, are we so sure that our Western ideas are so right that we must try and force them on unwilling customers? The answer to this surely is that in a world which has grown so small, the African just cannot insulate himself and his ways against the impact of so-called modern civilization.

Classification of African Lands into Land-Use Categories

THE PRESENT POSITION IN REGARD TO LAND USE

A brief statement is made here of the major land-use zones in the African areas adopted by the Agricultural Department for the purpose of planning farming development. These categories form the basis of agricultural investigation and research, of the Department's memoranda in 1953 to the Royal Commission on Land and Population in East Africa and of the implementation of the Swynnerton Plan. The ecology of Kenya has not yet been worked out in detail. Within the zones in which land-use planning is evolving, there are numerous variations of vegetation, soils and climate about which it is important to have further knowledge but the lack of which does not interfere with the main lines of development or the siting and planning of experimentation. The more detailed ecological knowledge and information on rainfall distribution, intensities and probabilities which affect farming systems and cropping is slowly being assembled by district agricultural officers or worked out by the research officers, ecologists and soil chemists of the East African Agricultural and Forestry Research Organization, the Agricultural Department and the Empire Cotton Growing Corporation.

The major ecological associations of Kenya were elaborated by D. C. Edwards, lately Senior Pasture Research Officer (A Vegetation Map of Kenya, *J. Ecol.*, 28th February, 1940). Subsequently agricultural officers in the field, aided by the research services, have gradually been working out farming systems which are likely to fit soundly into each land-use zone, particularly into those zones in which farming can be applied more or less intensively using grass leys and, when they become available, productive livestock. Ideas have to a large extent been crystallized by the land-use policies prepared by L. H. Brown in 1950 for the Central and Southern Provinces and in 1953 for the Nyanza Province (departmental memoranda). The main outcome of these departmental studies has been to suggest that, provided sound land use is applied, families can be supported at a profitable level on acreages considerably smaller than had formerly been considered possible, e.g. in the studies of Norman Humphrey, lately Senior Agricultural Officer (The Kikuyu Lands, 1945; The Liguru and the Land, 1947). This does not mean that the door to Utopia is open. Besides the large field of agricultural research and investigation that lies ahead, there is the profound sociological problem of persuading the people to reorientate their land use at a pace sufficient to ensure that it is completed before it is made utterly impossible by the swelling population which is expected to double itself in 25 or 30 years. This is a challenge as much to the administrator and the educationist as to the agriculturist.

The Annual Reports of the Agricultural Department in recent years have described (whilst those of the African Land Development Board have depicted) the gradual evolution from land conservation by means of erosion control, bush and bracken clearing, paddocking and bench terracing and the manufacture of manure and compost to the wider concepts of farm planning, the skeletal lay-out of topographical areas, the consolidation of fragmented holdings into economic units and the planting of cash crops in suited areas, subject to guidance on market prospects. The programme of land conservation in the more favourable climatic zones may be said to be at its peak while planned farming is in its infancy. Planned farming is essential because, despite land conservation, large areas of the African lands are in the throes of exhaustion cropping, which is the trough between the older restorative measure of shifting cultivation and the newer concept of balanced mixed farming. The former method aimed at restoring fertility through a period, the longer the better, of unproductive fallow under a weedy and woody growth. Where rainfall was adequate the fertility built up by forests or bush was drawn upon and, when that was exhausted, the land was left to revert to the succession of weeds, bush, thicket or forest. Mixed farming aims at building up fertility to a high level and maintaining it there by rotating crops, using manures, green manures or fertilizers as necessary, with grass which will both build up fertility and yield a profitable return through productive livestock.

The present state of static exhaustion cultivation has been brought about by over-population and/or by over-stocking. As land has become scarce, the period of fallow under shifting cultivation has been reduced and its restorative effect has diminished or disappeared. Grazings have become denuded and the opportunities for nomadic pastoralism have become reduced. These are the effects of 60 years of the Pax Britannica and of medical and veterinary science. Population pressure is bringing about individual land tenure which, although desirable in itself, is in the present state of the law resulting in the fragmentation of land

holdings, each individual having many small scattered plots. Fragmentation can only work so long as there is space for shifting cultivation under relatively low population densities. In large areas of the Central and Nyanza Provinces, with population densities of 400 to 1,000 to the square mile, exhaustion cropping and static cultivation are synonymous and must in no way be confused with sound farming. Hence the present drive for consolidation into land holdings which can be farmed economically and into lay-outs which can be planned topographically under the guidance of the agricultural officer.

There is now a reasonably sure accumulation of knowledge in regard to soil control, land-use categories, crop husbandry, grassland establishment and management and cash crops to proceed with farm planning for the African in the lands acknowledged as suited to arable cultivation. The weak link in the chain, and one which may deter the African from adopting mixed farming, is the almost complete lack of productive Zebu cattle and the prospect that they will not be available in adequate numbers in the next 20 or 30 years. There are extensive areas in the African highlands which are suited to the use of high-yielding exotic stock. There is an increasing number of African farmers whose standards of husbandry justify the use of bulls of approved exotic breeds for grading-up the farmers' herds of Zebu cows under controlled insemination conditions. Without the controlled introduction of sires and heifers, the African will obtain scrub exotic or grade animals through the back door, as has been done in at least one instance, and bring the conception into disrepute with his fellows or else he will prefer to continue to mono-crop with maize or wheat because, even at exhaustion levels, it will be more profitable than to rest his land under grass.

It is against this background that the planning of land use must be considered. The obstacles are unsound land tenure, uneconomic livestock and farmers lacking in the mass the desire to advance. The stage which we have reached is illustrated by an estimation of current land use in the Central Province, the home of the troubled Kikuyu, Embu and Meru tribes. The following table shows the proportion of land under shifting cultivation, under the present state of static cultivation or exhaustion cropping and under relatively sound balanced farming. The higher proportion under shifting cultivation in Embu and Meru is due to lower population densities, while in the Kikuyu districts the area under shifting cultivation is largely represented by the infertile bracken zone below the forest edge.

FORMS OF CULTIVATION: CENTRAL PROVINCE

District	Population per sq. m.	(1)	(2)	(3)
		Sound Stable Farming	Static Unsound Cultivation	Shifting Cultivation
		Per cent	Per cent	Per cent
Kiambu	860	3.7	87.8	8.5
Fort Hall	499	6.2	83.5	10.3
Nyeri	596	7.0	86.7	6.3
Embu	351	2.5	65.8	31.7
Meru	236	2.2	64.5	33.3

Classification of Land Use Categories

The following description of land-use categories has been prepared by consolidating information on land classification contained in an analysis of provincial agricultural policies prepared for the Royal Commission on Land and Population in East Africa, in a departmental paper on research written by the Chief Research Officer, Dr. C. C. Webster, and in a recent paper on agricultural policy in Nyanza written by L. H. Brown, the Assistant Director (Field) for that Province:—

1. LAND SUITED TO INTENSIVE MIXED FARMING, INCLUDING GRASS LEYS

1. *Very High Altitude Areas*

(a) *High Cold Mountain Zone*

Nyanza Province: Mount Elgon.

Rift Valley: parts of Elgeyo, West Suk and Samburu: 8,000 ft.—10,000 ft.; rainfall over 40 in. in one season over 7–8 months; embraces about 960 square miles.

Low temperatures, thin soils and steep topography limit the degree of intensification which is possible. The growth rate of this coarse grass downland is poor. It is suitable for ranching cattle and woolled sheep, with pockets of better land totalling about 15 per cent of the whole suitable for arable.

(b) *Bracken Zone*

Central: parts of Kiambu, Fort Hall, Nyeri, Embu and Meru lying below the Aberdare and Mount Kenya forest line at 6,000–7,500 ft.; rainfall over 55 in. in two seasons. This zone covers about 320 square miles.

Low temperatures, light powdery soils deficient in available phosphate and calcium, and steep topography limit degree of intensification possible. The vegetation consists of bracken and *Triumfetta* bush with poor grasses and small areas of cultivation. Investigation into cash crops such as potatoes, wattle, pyrethrum and tea, into raising the productivity of poor Kikuyu grass or replacing it with more satisfactory species and into the requirements of manure, phosphates and lime is proceeding as this represents a potential settlement area for displaced Kikuyu.

2. *Higher Altitude Short Grass Areas*

There is no clear-cut division between the Kikuyu and Star grass zones: large areas comprise a mixture of both species. For major factors of general husbandry, the two zones can be considered together and form lands of high potential. Their total area covers some 5,000 square miles. The original vegetation was either forest or the *Acacia abyssinica*–*Vernonia*–*Hyparrhenia cymbaria* association. Because of their good climate and soils, these zones are heavily populated under conditions of static cultivation, individual land tenure and severe fragmentation of holdings. Investigation will centre on grass ley species and their establishment, productive livestock, rotations, manure, fertilizers and cash crops.

(a) *Kikuyu Grass Zone*

Central: parts of Kiambu, Fort Hall, Nyeri, Embu, Meru; 5,500–6,500 ft.; rainfall 35–50 in. in two seasons.

Rift Valley: parts of South Nandi, West Suk, Elgeyo, Baringo: 6,000–7,000 ft.; rainfall 40–60 in. in one season over 6–7 months.

Nyanza: part of Kisii Highlands, Kaimosi area of North Nyanza; 6,000–6,500 ft.; rainfall 50–65 in., two planting seasons.

This zone should give good returns under intensive mixed farming and can grow potatoes, wattle, pyrethrum, tea and, at the lower level coffee as cash crops.

(b) *Star Grass Zone*

Central: parts of Kiambu, Fort Hall, Nyeri, Embu, Meru; 4,500–5,500 ft.; rainfall 30–50 in. in two seasons.

Coast: Teita Hills; 4,500–5,500 ft.; rainfall 45–55 in. in two seasons.

Nyanza: part of Kisii and Sotik Highlands, Lambwe Valley, Bunyore–Maragoli, Kimilili area, etc.; 4,000–6,000 ft.; rainfall 50–60 in. in two seasons.

Rift Valley: parts South Nandi, West Suk, Elgeyo, Baringo; 6,000–6,500 ft.; rainfall 40–50 in. in one season of 6–7 months.

Southern: Machakos Hills; 4,500–6,000 ft.; rainfall over 40 in. in two seasons.

In much of this zone coffee is a suitable cash crop except at the lower altitudes and in Rift Valley Province.

(c) *Medium Altitude Tall Grass Areas or High Rainfall Savannahs*

This is the typical *Combretum-Hyparrhenia* vegetation zone of D. C. Edwards and in the African areas it only occurs very extensively in the Nyanza Province. L. H. Brown describes the zone in Nyanza as consisting of “short tree-high grass associations of various sorts with the following grasses important: *Cymbopogon validus*, *Hyparrhenia rufa*, *Hyparrhenia filipendula* and *Imperata cylindrica* associated with *Combretums*, *Erythrinas* and *Bauhineas* among trees. At present much of the grassland is poor and coarse. This zone generally is capable of great development”.

Central: Limited areas of Fort Hall, Nyeri, Embu, Meru at the upper edge of L. H. Brown’s “Grass Plains or Savannah” zone; about 4,500 ft.; rainfall 35 in. in two seasons.

Nyanza: Large parts of North and Central Nyanza (excluding lake shore areas and Kano Plains), much medium elevation land in South Nyanza; 4,000–5,000 ft.; rainfall mostly 50 in. or more, two planting seasons.

Rift Valley: North Nandi (c. 200 sq. m.); 6,000–6,500 ft.; rainfall 40 in. in one season; West Suk—narrow strip at and along foot of escarpment where mixed farming is probably only practicable in Chepkorio areas; 5,500–6,000 ft.; rainfall 35 in. in one season.

II. IMPEDED DRAINAGE SUB-ZONES OF NYANZA PROVINCE

L. H. Brown considers that “poor drainage is a condition affecting possibly 1,000 square miles in Nyanza Province. The areas which result require different treatment to the balanced mixed farming zones although they may have equally favourable rainfall”.

(a) *Grouped Tree Grassland* (D. C. Edwards)

Nyanza: Southern Sotik Highlands and Butende area of South Nyanza: rainfall 50 in. with two planting seasons.

Brown writes that "the hillside pockets in Sotik originally supported *Acacia abyssinica*-*Hyparrhenia cymbaria* associations; on the flats the grassland between the hillocks are dominated by *Setarias* and *Pennisetum catabasis*. The very large areas of flats will only be of limited value until the drainage problem is solved. The impeded drainage is caused by a hard pan just below the surface. In the 150-200 square miles of Butende country, the zone is generally valuable stock country with patches suitable for arable. In impeded drainage conditions grouped tree grassland dominated by *Themeda triandra* and *Loudetia kagerensis* occurs".

(b) *Seasonal Swamps*

Nyanza: East Konyango area of South Nyanza, about 400 sq. miles in extent; 3,800-4,000 ft.; rainfall 40-50 in.

Brown describes the area as "a grass plain on black clay soil with an almost uniform association of *Pennisetum catabasis* with Star grass. The impeded drainage is caused by the soil type". The utilization of this grass plain for sugar, arable crops and improved grass depends upon the success of relatively simple drainage measures.

III. LANDS SUITED TO MIXED FARMING, INCLUDING GRASS LEYS OF ONLY MODERATE INTENSITY

The areas in this category can be regarded as transitional between D. C. Edwards' *Combretum-Hyparrhenia* and *Acacia-Themeda* vegetation types. They include Brown's "Grass plains, savannah or grass-woodland" and *Acacia-Combretum* areas of Central Province and his "lake-shore savannahs" of Nyanza as well as a small proportion of the "Perennial ranching areas" formerly described for Rift. Although the range of conditions covered is considerable—from areas where leys can be established with relatively little difficulty to those where their use becomes precarious—the whole of these lands can be mixed farmed to a greater or lesser intensity provided care is taken and emphasis placed on dry season fodder, drought-resistant crops and special measures in ley establishment. There is a constant transition from wetter to drier conditions throughout the major areas in this category, interrupted by pockets of better rainfall and, for general purposes, there is no need to divide it. The sub-zones include:—

- (i) An association of *Terminalia-Dombeya-Cussonia-Faurea-Combretum* woodland with *Hyparrhenia-Brachiaria-Digitaria-Panicum maximum-Themeda* grasses on both granitic and volcanic soils indicating a reasonable rainfall suitable for balanced farming.
- (ii) An association of *Combretum-Themeda* on both volcanic and granitic soils indicating a poor rainfall probably sub-marginal for agriculture.
- (iii) The *Acacia-Combretum* zone lying on metamorphic soils affecting large areas of the Machakos "bad-lands" and of Kitui. Grass species, although they occur over a wide variety of climatic conditions, useful as climatic indicators include *Cenchrus ciliaris*, *Eragrostis superba*, and *Heteropogon contortus*. *Themeda* and *Panicum maximum* also occur.

(iv) In the "perennial ranching" areas, if protected, *Cynodon* spp., *Hyparrhenia* and *Pennisetum stramineum* can be maintained satisfactorily.

(v) In the lake-shore savannahs typically the grassland is *Themeda-Bothriochloa* with some *Hyparrhenia* and *Loudetia kagerensis* dominant on stony ground. Trees are mainly *Acacias* with *Balanites* also very common.

Central: Parts of Fort Hall, Nyeri, Embu, Meru; 4,000–4,500 ft.; rainfall 25–35 in. in two seasons.

Rift Valley: Limited parts of West Suk, Elgeyo, Baringo, Samburu; 4,500–5,500 ft.; rainfall 25–30(+) in. in one season, fairly reliable.

Nyanza: The whole of the lake-shore strip excluding Kano Plains and Uyoma Peninsula; 3,700–4,000 ft.; rainfall 35–40 in. in two seasons.

Southern: Large parts of Machakos, excluding hills but including the better parts of Makueni Settlement, part of Kitui; 4,000–5,000 ft.; rainfall 30(–)–40(–) in. in two seasons.

Coast: Much of the Coast intermediate belt is in this land-usage category but is dealt with at VII (a) below.

IV. SEMI-ARID RANCHING AREAS WITH POSSIBILITY OF MINIMUM SUBSISTENCE ARABLE

These are areas slightly drier than those of Zone III above, including part of Brown's "*Acacia-Combretum*" (Central and Southern Provinces) and part of the "perennial ranching" areas (Rift Valley Province) and even including lands where *Commiphora* is much in evidence, which are primarily suited to ranching but where a strictly limited arable area for the production of the whole or part of the food requirements of a sparse population is possible with the aid of fertility transferred from the grazings and probably on a shifting cultivation basis. These areas are of low potential and their main needs are for drought resistant crops and for pasture research.

Central: Parts of Embu and Meru, 3,000–3,500 ft.; rainfall 25–30 in. in two seasons.

Rift Valley: Parts of West Suk, Elgeyo, Baringo and Samburu; 3,000–3,500 ft.; rainfall 20–30 in.

Southern: Southern part of Machakos including part of Makueni Settlement area and limited areas as far south as Darajani; part of Kitui; 2,500–3,800 ft.; rainfall 20–25 in. in two seasons.

Coast: Areas of similar utilization occur in the Coast Hinterland ranching areas.

V. SEMI-ARID PURELY RANCHING AREAS

These areas are of the *Acacia-Themeda* or *Acacia-Commiphora* type and include large denuded areas as well as grasslands in fair condition. High temperatures and evaporation combined with low rainfall of short period distribution render cultivation scarcely practicable, except in localized pockets. In the bush country *Digitaria milaniana*, *Eragrostis superba*, *Cenchrus ciliaris* deteriorate with over-grazing to thickened bush, *Chloris myriostachya* and *Aristida* spp. The main work required is restoration of denuded areas including bush control, and grazing management of natural grasslands.

Central: Parts of Embu and Meru; 3,000–3,500 ft.; rainfall less than 25 in., unreliable.

Rift Valley: Parts of West Suk, Elgeyo, Baringo, Samburu; 3,000–3,500 ft.; rainfall around 20 in.

Southern: Parts of Machakos and Kitui; Masailand; rainfall 20–25 in., unreliable.

Coast: Hinterland areas.

VI. ARID PASTORAL AREAS

D. C. Edwards' "Desert Grass-Bush" and "Desert-Scrub", comprising two-thirds of Kenya.

VII. COASTAL AREAS

The Coastal Strip and the Coastal Intermediate belt described below comprise about 1,900 square miles:—

(a) *The Coastal Strip*

A strip 10–15 miles wide running the whole length of the Kenya Coast, altitude little above sea level; rainfall 35–55 in., not very reliable or well distributed. Vegetation is described by C. C. Webster as including remnants of the original forest and open woodland (*Brachystegia*, *Trachylobium*, *Cynometia*, *Bombax*, *Adansonia*, *Azelia*, *Erythrina*, *Chlorophora*, *Cussonia*) and a Doum (*Hyphæne*) Palm Zone with *Borassus*. Associated grasses are tall, of the *Hyparrhenia* type and include also *Rottbælia*, *Digitaria*, *Imperata*, *Andropogon* spp., *Cymbopogon excavatus*, *Heteropogon contortus*, *Brachiaria brizantha*, *B. leersioides*, *Panicum maximum*, *P. trichocladium*, *Cenchrus ciliaris*, *Eragrostis ciliaris*, *Cynodon*, *Enteropogon macrostachya*. The soils are mostly sands or loamy sands, capable of carrying a good cover of forest, but once the cycle of nutrients between forest and soil is broken by bringing land under cultivation, there is a rapid run down of fertility due to destruction of organic matter and leaching of nutrients from soils not initially of high nutrient status. Emphasis is placed on tree crops (coconuts, cashew nuts, kapok, mangoes, citrus, bananas). It is desirable to keep arable cropping to the minimum to produce essential food. It is possible that only long-term bush or tree fallows, involving shifting cultivation, will be practicable in restoring fertility if cattle cannot be kept or green manuring is unsuccessful.

(b) *Coastal Intermediate Belt*

A transitional belt between the coastal belt and the much drier hinterland (Zones IV and V). Altitude 400–800 ft., rainfall 30–50 in., two seasons, poorly distributed. Soils mostly sandy, with limited areas of better loam. In parts vegetation is described by C. C. Webster as including many species listed under VII (a), but other characteristic trees are *Diospyros* sp., *Terminalia* spp., *Combretum* spp., *Acacia* spp. and, on the drier side, *Commiphora* and *Euphorbia*. Grasses include *Eragrostis superba*, *Chrysopogon anchori*, *Themeda*, *Aristida*, *Leptochloa obtusifolia*, *Chloris virgata*, *C. pycnothrix* and *C. macrostachius*. Stock keeping is at present restricted but may be expected to increase. Ley establishment is practicable but emphasis must be placed on tree crops over most of the area and on ranching in a limited portion of it, with arable cropping minimized.

VIII. FLOOD PLAINS, SWAMPS AND IRRIGABLE AREAS

These are dealt with in some detail on pp. 43-46 of the published "Plan to Intensify the Development of African Agriculture in Kenya".

Weather

Good weather conditions and adequate rainfall were experienced in Nyanza, Rift Valley, Central and Southern Provinces during the year. The Coast Province, however, had a poor year.

In Nyanza the long rains of 1954 were up to time, well distributed and adequate. There were no areas of local shortage as in the previous year. In general the drier areas of the Province came off better than the higher and wetter areas which to some extent suffered from excess rainfall. The short rains were delayed and brief and the long gap between the two rains severely affected the cotton crop.

The Rift Valley Province, after two dry years, experienced a welcome increase in rainfall in all districts. In general the distribution of the rain was good, although a few heavy falls were recorded. Springs and dams have been replenished and crops for harvest in 1955 are promising.

In the Central Province the long rains were extremely good and well distributed except in Meru District. The Gathano was prolonged and harvests were well above average more especially in the Mwea Plain of Embu District where a very heavy crop of maize was taken off. At the close of the year prospects from short-rain plantings were poor except in Northern Embu and Meru where the weather paid its debt and the short rains were good.

Rainfall generally throughout the Southern Province was favourable, Kitui being particularly well favoured. Machakos and Masai had a moderate year though the short rains of 1953 were only sufficient to produce a bare subsistence harvest. The long rains of 1954 were well distributed encouraging the growth of grass particularly. The short rains were again favourable for grass growth but owing to rather short duration, crop prospects are not too promising.

Throughout the Coast Province the total rainfall was less than normal and the distribution bad. The year opened with three months of total drought and closed with five months of partial drought. Everywhere the short rains were a partial or total failure and no short-rain planting took place at all in the lower areas. Cotton crops have been seriously affected and only about one-fifth of cereal crops on the North Coast and in the Hinterland reached maturity.

(The Director of Agriculture is indebted to the Director of the East African Meteorological Department for the following detailed notes on weather conditions and for Table A which shows the rainfall over the main agricultural areas of Kenya during 1954.)

Rift Area.—Amounts well above average were recorded from April to July and slightly above average in September. The rest of the year was drier than usual but the total for the year was 14 per cent in excess of average.

West Rift.—Totals above average were recorded in May, July, August, September and December but the other months showed a deficiency giving a total for the year slightly less than normal.

TABLE A.—RAINFALL OVER THE MAIN AGRICULTURAL AREAS OF KENYA, 1954

Districts	RIFT		WEST RIFT		EAST RIFT		TRANS NZOIA		NYANZA		MAIN COFFEE		COAST	
No. of Stations	20		13		21		22		23		27		23	
	Mean Fall, 1954	Average Fall	Mean Fall, 1954	Average Fall	Mean Fall, 1954	Average Fall	Mean Fall, 1954	Average Fall	Mean Fall, 1954	Average Fall	Mean Fall, 1954	Average Fall	Mean Fall, 1954	Average Fall
	In.	In.	In.	In.	In.	In.	In.	In.	In.	In.	In.	In.	In.	In.
Jan. . .	0.56	0.99	1.14	1.43	0.16	0.84	0.26	0.71	1.42	1.90	0.87	1.26	0.02	0.76
Feb. . .	0.25	1.33	1.27	2.30	0.49	1.00	0.57	1.28	1.42	3.12	1.01	1.42	0.82	0.47
March . .	0.39	2.96	1.26	3.80	0.47	2.33	2.52	2.74	2.79	5.44	0.37	4.35	1.10	2.09
April . .	8.09	5.89	7.43	7.51	6.69	5.34	5.41	6.08	11.14	9.33	12.06	9.30	10.00	6.33
May . .	9.19	4.89	9.29	6.56	5.87	4.03	6.70	6.22	11.67	9.26	9.50	5.11	7.85	12.18
June . .	5.54	3.22	4.27	5.30	3.58	2.58	4.23	4.82	5.25	5.97	2.35	1.53	2.81	4.46
July . .	6.59	4.27	6.87	5.76	4.67	3.99	6.20	6.11	4.92	5.00	1.32	0.64	1.58	3.18
Aug. . .	3.80	4.44	6.56	6.48	4.81	4.15	6.92	5.47	5.70	6.18	0.63	0.93	2.21	2.48
Sept. . .	2.66	2.53	5.02	3.99	3.62	1.83	4.53	3.84	5.26	5.74	0.23	1.04	1.37	2.42
Oct. . .	1.70	1.97	2.23	2.61	1.75	2.08	2.27	3.01	4.22	4.34	1.42	2.70	1.10	3.33
Nov. . .	1.93	2.72	1.05	2.81	3.59	3.08	0.94	2.30	2.23	4.42	6.50	5.86	1.83	2.80
Dec. . .	1.72	1.85	2.61	2.25	1.90	1.95	1.97	1.14	4.44	3.36	1.26	2.44	1.42	2.72
YEAR . .	42.42	37.06	49.00	50.80	37.60	33.20	42.52	44.72	60.46	64.06	37.52	37.58	32.11	43.22

East Rift.—In the East Rift area the total rainfall for the year was 13 per cent above average. Rainfall was above average for the period April to September and again in November. The other months showed a deficit varying from 3 per cent to 81 per cent.

Trans Nzoia.—Amounts in excess of normal were recorded in May, July, August, September and December but the short falls in other months resulted in a slight deficit for the year.

Nyanza.—Rainfall for the year was slightly below average. Totals in excess of average were recorded in April, May and December and over the period July to October amounts were very close to normal but the other months of the year were below average.

Main Coffee Areas.—March was a particularly dry month and the long rains did not start until April: however, amounts were well above average for the period April to July. The short rains were also late and of short duration with falls in October and December well below average resulting in amounts for the short rains substantially below normal. The total for the year, however, was up to average.

Coast Area.—With the exception of February and April rainfall was below average throughout the year, the deficits varying from 11 per cent to 97 per cent, resulting in a deficit of 26 per cent for the year.

Food Production in African Areas

In Nyanza Province, for the first time since before 1939 there has been a drop in the maize price paid to the grower, partly due to a slight decrease in price and partly due to the maize cess of Sh. 3 per bag. In spite of this an enormous crop from 1953 planting was offered for sale. In Kisii District a record crop was exported during the year and very heavy crops were also produced in other districts. The 1954 planted crop which is now coming on to the market is expected to be equally as good. Good crops of finger-millet, sorghum and rice have also been produced during the year.

Although in the higher areas of the Rift Valley Province yields of maize are not so good as last year, the overall crop is good and in the low country of the Kamasia and Lower Rift quite exceptional. An exportable surplus of 100,000 bags is expected, mainly from Nandi. Finger-millet and sorghum production are sufficient for local needs while a surplus of 6,000 bags of wheat mainly from Elgeyo, is expected.

In the Central Province the long rains maize crop was above average except in Meru where local shortages are expected to be made good by the short rain harvest of 1954–55. Small surpluses of maize, Bulrush millet and beans were marketed during the year.

In the Southern Province, Machakos District was a steady consumer of imported maize during the early part of the year. The short rains produced only a subsistence harvest and, although the long rains harvest alleviated the position, by the end of the year a total of 103,000 bags of food had been imported into the district. Kitui District fared better and only 15,000 bags of food were imported.

Owing to poor rainfall conditions throughout the year the food position throughout the Coast Province was unsatisfactory. In the hinterland of Kwale and Kilifi Districts the situation was particularly serious because the crops failed to mature. Everywhere in the Province, however, fair stocks of cassava in the ground have saved the situation.

The large surpluses of maize from Nyanza are, however, sufficient to meet the shortages in the more arid areas leaving a considerable balance for export in 1955.

Agricultural Exports, 1954

The total value of agricultural exports increased by more than £1,000,000 from £16,718,264 in 1953 to £17,823,241 in 1954, but was still far below the record figure of £22,752,477 reached in 1952. The increase was mainly due to increased export of tea, maize and pyrethrum extract.

Exports of the following nine commodities exceeded £500,000 in value, wheat flour falling out, and maize and pyrethrum coming into the table:—

				<i>Position</i> <i>1953</i>	<i>1953</i> £	<i>1954</i> £
1. Coffee	..	..	..	(1)	6,712,730	5,711,337
2. Tea	..	..	..	(5)	928,276	2,062,654
3. Sisal	..	..	..	(2)	2,482,469	2,041,563
4. Wattle Extract	..	..	..	(4)	1,544,720	1,668,037
5. Maize	..	..	..	—	306,017	1,013,192
6. Pyrethrum incl. Extract	..	..	..	—	395,852	905,047
7. Cotton	..	..	..	(6)	511,792	796,041
8. Cattle Hides	..	..	..	(8)	798,325	759,217
9. Sheep and Goat Skins	..	..	..	(7)	565,151	622,353

The following table shows certain other agricultural exports:—

				<i>Position</i> <i>1953</i>	<i>1953</i> £	<i>1954</i> £
10. Butter	..	..	..	(13)	239,495	483,117
11. Wheat Flour	..	..	..	(6)	573,545	269,096
12. Castor Seed	..	..	..	(11)	266,721	253,190
13. Wattle Bark	..	..	..	—	58,591	219,979
14. Wool	..	..	..	(12)	257,100	214,530

Table "B" gives fuller details of domestic exports from Kenya in 1954, while Table "C" gives comparative domestic quantities and values of exports of Kenya produce for the years 1939 and 1951–54 inclusive.

TABLE B.—DOMESTIC EXPORTS—KENYA, 1954
(Figures provided by the Commissioner of Customs and Excise)

ARTICLES	Unit of Quantity	Quantity	Value
			£
LIVE ANIMALS, CHIEFLY FOR FOOD			
Bovine cattle, including buffaloes	Number	650	33,493
Sheep and lambs	..	26	180
Swine	..	—	—
Poultry	..	2,580	675
Goats and kids	..	278	433
MEAT AND MEAT PREPARATIONS			
<i>Meat: Fresh, Chilled or Frozen—</i>			
Meat of bovine cattle (beef, veal)	Centals of 100 lb.	24,867	141,215
Meat of sheep or lambs (mutton, lamb)	..	451	4,098
Meat of swine (pork)	..	339	3,904
Poultry, killed or dressed	..	470	5,789
Meat of goats and kids	..	1,186	10,757
Other (including edible offals, horsemeat and game)	..	649	3,778
<i>Meat, Salted, Dried, Smoked or Cooked, not Tinned—</i>			
Bacon, ham and salted pork	..	15,903	164,300
Smoked, dried or salted beef	..	—	—
Smoked, dried or salted meats	..	22	771
<i>Meat, Tinned and Meat Preparations, Tinned and not Tinned—</i>			
Sausages of all kinds not in airtight containers	..	522	6,360
Meat and meat preparations in airtight containers	..	368	3,693
Meat extracts and preparations of meat (including natural sausage casings), n.e.s.	..	109	1,244
DAIRY PRODUCTS, EGGS AND HONEY			
Milk and cream, fresh (including buttermilk, skim milk, sour milk, sour cream and whey)	Imp. Gal.	6,776	1,254
Milk, sweetened or unsweetened, separated or skimmed	Centals of 100 lb.	8	56
Cream	..	103	1,440
Milk and cream, other (in blocks and powder form)	..	27	202
Butter in airtight containers or not	..	28,826	483,117
Butter, clarified—Ghee	..	30	455
Cheese and curd	..	148	2,355
Eggs in the shell	Number	3,069,385	42,424
Natural Honey	Centals of 100 lb.	—	—
Other Dairy Products, n.e.s.	..	—	125
CEREALS AND CEREAL PREPARATIONS			
Wheat and spelt (including meslin) unmilled	Centals of 100 lb.	—	—
Rice, not in the husk, including polished and broken rice	..	120	450

TABLE B. DOMESTIC EXPORTS—KENYA, 1954 (Contd.)

(Figures provided by the Commissioner of Customs and Excise)

ARTICLES	Unit of Quantity	Quantity	Value
			£
Maize (corn) unmilled (Indian corn)	Centals of 100 lb.	1,028,532	1,013,192
Oats, unmilled	"	3	8
Millet, unmilled	"	33,468	17,930
Meal and flour of wheat and spelt (including meslin)	"	151,549	269,096
Meal and flour of maize (corn)	"	6,275	8,182
Meal and flour of cereals, n.e.s.	"	1	4
FRUITS AND VEGETABLES			
Edible nuts (including fresh coconuts) other than nuts chiefly used for the extracting of oil:—			
(a) Coconuts	"	1,174	1,193
(b) Cashew nuts	"	20,721	21,437
Vegetables, fresh and dry, roots and tubers, not including artificially dehydrated—			
Potatoes, not including sweet potatoes	"	15,383	14,410
Beans, peas, lentils and other legumes (pulses) dry, including split	"	14,418	38,174
Onions	"	172	616
Garlic	"	2	11
Other vegetables chiefly for human food	"	—	20,050
Other vegetables, preserved or prepared in airtight containers	Centals of 100 lb.	3,553	14,858
Flour and flakes of potatoes, fruits and vegetables (including sago, tapioca and all other starches prepared for use as food)	"	219	690
SUGAR AND SUGAR PREPARATIONS			
Jaggery (Muscovado)	"	1,232	3,553
Sugar, not refined	"	551	1,404
COFFEE, TEA, COCOA, SPICES AND MANUFACTURES THEREOF			
Coffee, not roasted	"	241,324	5,711,337
Coffee, roasted	"	730	15,487
Tea	"	108,415	2,062,654
HIDES, SKINS AND FUR SKINS, UNDRESSED			
Hides and Skins (except Fur Skins) undressed—			
Hides of cattle, undressed:—			
(a) Ground-dried	"	2,048	16,847
(b) Suspension-dried	"	53,993	665,748
(c) Wet salted hides	"	11,660	76,622
Calf skins and kip skins, undressed—			
(b) Suspension-dried	"	211	2,975
(c) Wet salted	"	67	693
Sheep skins and lamb skins (except astrakhan, caracul, persian lamb, broadtail) undressed—			
(a) Ground-dried	"	222	1,947
(b) Suspension dried	"	12,088	168,375

TABLE B.—DOMESTIC EXPORTS—KENYA, 1954—(Contd.)

(Figures provided by the Commissioner of Customs and Excise)

ARTICLES	Unit of Quantity	Quantity	Value
<i>Goatskins and kidskins, undressed—</i>	Centals of		£
(a) Ground-dried	100 lb.	702	11,401
(b) Suspension-dried	„	16,915	440,630
Crocodile skins	„	911	39,009
Other hides and skins, n.e.s.	„	30	1,053
Other fur skins, undressed	—	—	153
Leopard skins, undressed	Centals of		
	100 lb.	4	1,445
<i>Sheep and Lambs' Wool—</i>			
Greasy or back-washed	„	4,603	67,180
Scoured	„	7,678	147,350
OIL SEEDS, OIL NUTS AND OIL KERNELS			
Groundnuts (peanuts) green, whether shelled or unshelled	„	615	1,317
Copra	„	—	—
Soya beans	„	8	40
Linseed (flax seed)	„	2	5
Cotton seed	„	—	—
Castor seed	„	140,382	253,190
Sunflower seed	„	57,586	88,925
Other oil seeds, nuts and kernels	„	882	751
Raw cotton	„	61,002	796,041
Flax and flax tow and waste	„	481	3,341
Ramie and ramie tow and waste	„	100	889
Sisal	„	722,007	2,041,563
Mangrove bark	„	5,115	5,291
Wattle bark	„	152,131	219,979
Pyrethrum	„	25,905	334,272
Papain	„	30	2,562
Kapok	„	316	2,233
Pyrethrum Extract	„	1,651	570,775
ANIMAL OILS AND FATS			
Oils from fish and marine animals	„	16	349
Animal oils, fats and greases, excluding lard	„	463	3,005
VEGETABLE OILS			
Cottonseed oil	„	351	2,023
Groundnut (peanut) oil	„	253	1,582
Coconut (copra) oil	„	26	177
Sesame seed oil	„	152	875
Other vegetable oils	„	216	1,353
Hydrogenated oils and fats	„	50	513
Beeswax	„	1,375	25,985
Wattle bark extract	„	543,176	1,668,037
ESSENTIAL VEGETABLE OILS			
Lemon grass oil	Lb.	—	—
Bitter orange oil	„	—	—
Geranium oil	„	6,897	18,072
Cedarwood oil	„	53,538	9,691
Other	„	8,880	2,133
TOTAL			£ 17,823,241

Crops

Barley.—The production of barley from the 1953 crop was 183,308 bags (180 lb.) from 31,288 acres, an average yield of 5.86 bags an acre. The estimate of production from the 1954 crop is 240,922 bags from 33,244 acres, an average yield of 7.24 bags an acre. The increase in acreage is accounted for by small increases throughout the growing areas. In the Uasin Gishu and Trans Nzoia it is used mainly for pigfeed while in Nakuru and Naivasha considerable acreages have been planted for malting.

Cashew Nuts.—Yields were above average and 1,180 tons were delivered to the factory at Kilifi, an increase of 256 tons over the previous year. The trees set fruit well during the year and the 1955 crop is likely to be a record. Although the fruits will be small the quantity will be exceptional on account of the dry conditions during pollination. The price to the producer was controlled at 20 cents a lb. The total value to the producer was £26,450.

Cassava.—Officers of the department continued during the year to press the production of this crop as a valuable insurance against locust invasion and famine. Increased plantings took place in the Southern and Nyanza Provinces. Practically the entire production of fresh roots was consumed locally and only 110 tons of cassava flour was purchased by Produce Control mainly in the Coast Province. It is estimated that the area under this crop in the Nyanza and Coast Provinces amounted to 112,500 acres in 1954 giving an average out-turn of two tons of fresh roots per acre.

Castor Seed.—This crop is widely planted on terrace banks in the Southern Province where it serves both as a useful shelter and wind-break and a cash crop. Exports from the Southern Province increased from 3,000 tons in 1953 to over 5,000 tons in 1954. Small quantities were also produced in the Coast Province.

Chillies.—These are extensively cultivated on the lower slopes of the Teita Hills in the Voi District of the Coast Province. Here a crop of 375 tons was reaped and sold for £42,000. Production for the Province increased from 322 tons valued at £36,000 in 1953 to 455 tons valued at £50,960 in 1954.

Coffee.—The area planted to coffee by Europeans decreased from 60,700 acres in 1953 to 59,564 acres in 1954. Total production decreased from 12,190 tons in 1953 to 11,350 tons in 1954. The corresponding decrease in the average yield per acre was from four to 3.7 cwt. The reduction in the 1954 crop was due to the biennial-bearing cycle following the dry conditions of 1953. The prospects for an increased coffee crop in 1955 are good. The coffee crop retained its place as Kenya's most valuable export crop and the mean export value per ton for all grades increased from £453 in 1953 to £517 in 1954. The quantity of coffee exported decreased from 14,970 tons valued at £6,712,730 in 1953 to 10,773 tons valued at £5,711,337 in 1954.

Coffee-growing by Africans continued to expand. The number of licensed African coffee growers increased from 15,019 in 1953 to 18,806 in 1954. The corresponding increase in acreage is from 3,867 acres in 1953 to 5,339 acres in 1954 of which 1,084 acres are estimated to be in bearing. Almost exactly half the growers and half the acreage are in the Meru District of the Central Province. There are smaller areas in the Embu, Nyeri and Fort Hall Districts of the Central

Province and at Kisii and Kimilili in the Nyanza Province. There are also over 100 acres of coffee in the Teita Hills area of the Coast Province. The growing of this crop is closely supervised by the staff of the Department of Agriculture and high standards of cultivation and processing are being thereby maintained resulting in high yields and good quality. In all suitable areas a substantial increase in coffee nurseries has taken place aimed at raising new planting to 5,000 acres a year.

In the Kimilili area the first coffee factory has started operating and has greatly stimulated interest in coffee planting. This factory at Chwele is expected to produce a crop of about 15 tons of parchment this season.

In Kisii District four new mechanical factories with two disc pulpers were built during the year. Drying trays have improved processing of the crop and quality has again improved; of the parchment 37.25 per cent was in the first three grades.

The cup presented by the Coffee Board of Kenya for the best African coffee was again won by the Chogoria Coffee Society of Meru with an average basic scale value of 108.44 and average yield of 12.01 cwt. of coffee to the acre, Chuka being second with 107.42 and an average yield of 15.38 cwt., a highly creditable performance.

Copra.—The area under coconuts at the coast was estimated at 50,000 acres. Production during 1954 was estimated at 30,060,000 nuts most of which were consumed locally. The main areas of the Coast Province suitable to the crop are the restricted areas of higher rainfall Vanga/Gazi and the ridge from Makupa to Kaloleni and Lamu Island. Departmental work has been intensified in these areas and a campaign is proceeding to clean systematically the neglected plantations. The Department of Agriculture has established nurseries containing over 65,000 selected seedlings for "gapping up" in the cleaned plantations.

Cotton.—The final production figures for the 1953 planted crop, which was ginned early in 1954, were:—

				<i>Bales of lint of 400 lb. net</i>		
				<i>A.R.</i>	<i>B.R.</i>	<i>Total</i>
Nyanza Province	..	..	..	9,233	921	10,154
Coast Province	..	..	..	5,562	1,311	6,873
Kenya Total	..	..	..	14,795	1,232	17,027

In the Nyanza Province the 1954-55 crop is expected to be slightly better. The estimate of the area planted was 78,500 acres. Some success has been achieved in favour of early planting but in at least one area these early planted crops suffered very severely from the sharp drought in July and August. Late planted crops in some cases seem to have survived this drought and came through to flower again in the short rains. Damage has been caused by stainers in South and Central Nyanza and by Lygus in Northern and Western areas. The crop is estimated to produce a total of 9,500 bales. The price to the grower for seed cotton has been increased to 60 cents per lb. for "A" quality and 23 cents per lb. for "B" quality.

In the Coast Province the 1954-55 crop will be much reduced. In Malindi, the main cotton area, planting was late and missed the best rains for establishing the crop. Only 17,000 acres were planted, growth was poor and yields collapsed, the crop withering in the drought. There was only one picking but quality was good as there was little insect or weather damage. The crop is estimated at 2,150 bales.

The Nyanza crop was marketed through the Uganda Lint Marketing Board and the Coast crop was sold by tender. Exports of raw cotton increased from 42,231 centals valued at £511,972 in 1953 to 61,001 centals valued at £796,071 in 1954.

Essential Oils.—The Lumbwa District produced a fair crop of geranium oil which was, to some extent, set back by dry weather in June and July. Exports of geranium oil increased from 40 cwt. valued at £17,742 in 1953 to 61 cwt. valued at £18,072 in 1954. Exports of other essential vegetable oils in 1954 amounted to 619 cwt. valued at £29,896.

Flax.—Exports of this crop decreased from 87 tons valued at £13,333 in 1953 to 22 tons valued at £3,341 in 1954.

Groundnuts.—The main production of this crop is from the Lakeshore area of the Nyanza Province. Sales of groundnuts to the Produce Control organization increased from 627 tons valued at £21,654 in 1953 to 1,412 tons valued at £43,465 in 1954. This increased production came from both Central and South Nyanza.

Kapok.—Production decreased from 99,000 lb. valued at £2,970 in 1953 to 29,420 lb. valued at £735 in 1954. Most of the crop was bought by Malindi Ginneries Ltd. at a price to the grower of 70 cents per lb.

Linseed.—Actual production from the 1953 crop was 5,471 bags (200 lb.) from 2,209 acres, the average yield being 2.48 bags an acre. The estimate of production from the 1954 crop was 2,371 bags from 1,354 acres giving an average yield of 1.75 bags an acre.

Maize.—Actual production from the 1953 crop in the non-native areas was 1,103,319 bags (200 lb.) from 164,827 acres, an average yield of 6.69 bags an acre. The estimate of production from the 1954 crop was 1,427,048 bags from 171,544 acres, giving an average yield of 8.31 bags an acre. The substantial increases in acreage have taken place in the Trans Nzoia and Uasin Gishu. Acreages in the Nakuru and Laikipia Districts remain static.

In the African areas the estimate of the area planted for the long rains crop was 1,435,700 acres. Yields were good in the Central, Rift Valley and Nyanza Provinces whereas in the Southern Province only a subsistence crop was reaped and in the Coast Province the drought seriously depressed yields. The only Province with an appreciable surplus was Nyanza.

Deliveries to the Maize Control during the past two crop years ending 31st July were:—

				<i>Bags of 200 lb. net</i>	
				<i>1952/53</i>	<i>1953/54</i>
Non-African Areas	..	..	726,097	739,707	
African Areas	..	..	744,739	1,388,280	
Total				1,470,836	2,127,987

From the 1954 crop very large surpluses are again expected from the European areas and from Nyanza Province. The purchase of maize produced in the Nyanza Province has been a real problem largely owing to the fact that the Produce Control stores still contain quite a large quantity of maize as a backlog from previous years and from Uganda.

The guaranteed free on rail price for Grade II maize from the 1954 crop was Sh. 38/15 per 200 lb. bag without bag. To this was applied a cess of Sh. 3 per bag by agreement with the growers to cover estimated losses on export due to the need to effect substantial exports from the 1953 planted crop at prices below the equivalent price guaranteed locally through the posho price structure.

Oats.—The actual production of oats from the 1953 planted crop was 143,083 bags (150 lb.) from 22,600 acres, an average yield of 6.33 bags an acre. The estimate of production in 1954 was 193,858 bags from 27,540 acres giving an average yield of 7.07 bags an acre. Milling requirements being limited, the increase in production is being used as stock feed. Individual crop yields of up to 20 bags per acre have been recorded this year.

Other Cereals.—Production of Sorghum, Finger and Foxtail Millets in the African areas though considerable is largely consumed by the growers. In the crop year ending 31st July, 1954, 86,893 bags of these cereals were sold to the Produce Control and of this 60,848 bags (180 lb.) was Sorghum from Nyanza Province which Produce Control found difficult to sell.

Passion Fruit.—There was a slight increase in interest in the Sotik area and some passion fruit was also established in Lumbwa. Total production for 1954 amounted to 3,109 gallons, local sales to 1,771 gallons and the number of growers was six. The acreage under crop in the Sotik area in 1954 was 88 acres and at Lumbwa 40 acres.

Potatoes.—In the Central Province crops did well during the year with Kiambu coming back to production again. Production in Meru District slumped due to the creation of prohibited areas for security reasons. Blight and paucity of resistant seed remain the limiting factors to increased production. Dutch Robyjin, a blight-resistant variety, is being bulked up gradually in all districts of the Province. Yields in the Kericho District of Nyanza Province have been above average. The value of recorded sales from the African areas amounted to £70,427 in 1954 as compared with £99,755 in 1953. The tonnage was reduced from 13,358 tons in 1953 to 6,337 tons in 1954. Exports decreased from 1,050 tons valued at £18,200 in 1953 to 687 tons valued at £14,410 in 1954.

Increased production of sweet potatoes for home consumption took place in the African areas during the year.

Pulses.—Bean crops were below average in Nyanza Province, good in Central Province and fairly good in the Southern Province. A useful crop of cowpeas was harvested and consumed locally in the Southern Province but in the Central Province this crop has largely been ousted by grams whereas in Nyanza Province the crop is used principally as a vegetable and is the most common pulse grown.

The recorded quantities of pulses of all kinds marketed from the African areas decreased from 10,894 tons valued at £308,624 in 1953 to 8,775 tons valued

at £147,409 in 1954. Deliveries to Produce Control in the crop year ending 31st July were:—

	1952/53	1953/54
	<i>Tons</i>	<i>Tons</i>
Beans, various	9,238	7,714
Field peas	195	1,127
Cowpeas, grams and others	4,006	1,678
Total	13,439	10,519

Exports of pulses, mainly beans, peas and dhal, decreased from 2,447 tons valued at £94,447 in 1953 to 644 tons valued at £38,174 in 1954.

Pyrethrum.—The area licensed for 1954 was 20.987 acres compared with 23.807 acres in 1953. Production of dried flowers increased slightly from 2,032 tons in 1953 to 2,064 tons in 1954. The local extract plant came into operation during the year. Flowers valued at £334,272 and extract valued at £570,775 were exported compared with flowers only in 1953 worth £395,852.

The increase in production of pyrethrum by Africans in the Central Province is shown below:—

	1953	1954
Acreage	1,086	1,652
Number of growers	586	1,008
Sales of flowers (tons)	110	170
Value	£29,680	£38,671

Most of the production comes from the Kiambu District, where marketing through co-operative societies has been organized. The number of growers in Nyeri District has increased during the year by nearly 100 per cent although still small in numbers. Acreage increases have also taken place during the year in South Nyanza where nearly 8,000 lb. of dried flowers were produced and obtained an average price of Sh. 1/90 per lb. A small area also began to yield on the slopes of Mount Elgon.

The Pyrethrum Board of Kenya has had to keep a close watch on the balance between demand and supply of dried pyrethrum flowers and locally produced extract and is undertaking a review of prospects of market expansion at the request of the Minister for Agriculture.

Rice.—The area under rice in Nyanza Province increased from 6,000 acres in 1953 to 9,000 acres in 1954. In North Nyanza a record crop was produced which is expected to amount to 50,000 bags. In Central Nyanza the large areas of irrigated rice on the Kano Plains bore good crops. In spite of flooding during the long rains on the Kano Plains it is anticipated that the total crop will amount to 4,400 bags of paddy. The quantity of paddy marketed in Nyanza Province increased from 1943 tons valued at £43,912 in 1953 to 2,600 tons valued at £59,439 in 1954. In the crop year ending 31st July, 1954, the quantity of clean rice milled in Nyanza Province and delivered to the Produce Control was 2,794 tons.

In the Coast Province the area planted decreased from 2,640 acres in 1953 to 2,550 acres in 1954. The 550 acres under irrigation at Vanga near the Tanganyika border is estimated to have produced some 14,000 bags much of which was used by the growers. The Tana River production was above average but only

450 bags are recorded as leaving the district. Crops in the coastal strip were very poor. The quantity of paddy marketed in the Coast Province decreased from 280 tons valued at £6,272 in 1953 to 11 tons valued at £230 in 1954.

Because of outstanding import licences and consumers' preference for the quality of Asiatic rices, Produce Control has had difficulty in disposing of locally grown rice. Work on selection of rices for improved quality is in progress.

Sisal.—The area under estate sisal increased from 249,519 acres in 1953 to 251,000 acres in 1954. The mature area cut increased from 120,587 acres in 1953 to acres 159,832 in 1954. Production decreased from 37,732 tons in 1953 to 34,411 tons in 1954.

The Machakos African Sisal Scheme continued to operate successfully during the year and the introduction of the portable raspador decorticator to Co-operative Groups has given considerable stimulus to the industry. Production overheads for these producers are small. There are now sixteen raspador units operating. Women are also still hand-decorticating a fair quantity. Production from the Machakos factory in 1954 amounted to 536 tons valued at £15,030.

In the Nyanza Province efforts were made during the year to start a fibre industry in Central Nyanza on the lines of the Machakos scheme but allowing the Nyanza Sisal Company to process the fibre. It is intended to use small mechanical decorticators for the production of fibre which will be brushed and baled by the Nyanza Sisal Company.

Sugar.—The area under sugar cane in Nyanza Province was 16,626 acres. The production of white sugar by the Miwani factory decreased from 10,578 tons in 1953 to 8,555 tons in 1954. This reduction is due to the effect of the 1953 drought on the sugar cane. The production of jaggery on the Indian farms increased slightly from 1,523 tons in 1953 to 1,560 tons in 1954; 1,400 tons of this being sold through the Nyanza Farmers' Co-operative Society. The production of sugar cane by Africans is on the increase. In North Nyanza a mobile jaggery plant has been operating successfully by travelling from farm to farm processing cane on the spot. The resulting increased production of jaggery has all been consumed locally.

In the Coast Province the area under cane at Ramisi decreased slightly from 7,200 acres in 1953 to 7,000 acres in 1954. The production of white sugar by the Ramisi factory in 1954 was 3,434 tons.

Sunflower.—Actual production from the 1953 crop was 58,761 bags (100 lb.) from 13,464 acres, an average yield of 4.36 bags an acre. Of this production 11,521 bags were retained on farms. The estimate of production from the 1954 crop was 61,926 bags from 14,465 acres, giving an average yield of 4.28 bags an acre. The increase in acreage results from the use of this crop as cattle food. Exports of sunflower seed rose from 1,796 tons valued at £65,283 in 1953 to 2,570 tons valued at £88,925 in 1954.

Tea.—The area under tea increased from 21,753 acres in 1953 to 23,346 acres in 1954. Production increased from 12,927,563 lb. in 1953 to 17,389,588 lb. in 1954. The value of exports rose from £928,276 in 1953 to £2,062,654. This was due both to an increased acreage in production and to improvement in prices in the latter half of the year.

The scheme for tea-growing by Africans continued to face difficulties. Nearly all the tea planted has been in the area of Mount Kenya, closed for security reasons. 45,206 plants were issued during the year to old and new growers. The

total acreage planted in 1954 was 11.63 acres including infills bringing the total acreage to 41.5 acres planted by 147 individual growers. There are over 1,200,000 plants available for distribution.

Tobacco.—The production of flue-cured tobacco continued on the same scale as in previous years in the Fort Hall, Embu and Kitui Districts under the ægis of the East African Tobacco Company who issue the seedlings and purchase the green leaf from African growers. In the Kitui District the long rains crop was the best on record. In the Fort Hall and Embu Districts the 1953 short rains crop was slightly better than the 1954 long rains crop. Purchases of green leaf decreased slightly from 1,167,832 lb. valued at £4,394 in 1953 to 1,052,614 lb. valued at £3,591 in 1954. The crop tends to remain static and make only a limited appeal to the African owing to the low cash yield per acre.

The production of snuff tobacco in the Southern Province is beginning to decline as the smoking of cigarettes increases. In the Central Province the average overall yield per acre remained at 300 lb. of cured leaf from the two crops. The snuff was sold at Sh. 7 per lb.

Vegetables, Fruit and Flowers.—In the Central Province the estimated area under African-grown pineapples in the Kiambu District increased from 3,250 acres in 1953 to 3,600 acres in 1954. Deliveries were made to the canning factory at Thika and in the Mua Hills. Total sales of this fruit increased from 3,000 tons valued at £37,500 in 1953 to 5,272 tons valued at £60,627 in 1954. Supplies of other vegetables and fruits into Nairobi from Kiambu have shown an increase in quantity and an improvement in quality. Vegetable production continues in the Karatina area of Nyeri District but supplies are consumed locally. The Fort Hall citrus crop was disposed of locally during the year as Emergency conditions precluded sales to a manufacturer of fruit squashes. The total sales of vegetables, fruit and flowers from the Central Province increased from 7,349 tons valued at £87,409 in 1953 to 17,148 tons valued at £204,429 in 1954.

In the Southern Province production of vegetables and fruit was maintained, 83 acres of green beans for canning were planted which brought a return of £1,690 to the producers. Production of strawberries decreased during the year and revenue to the growers declined from £28,221 in 1953 to only £2,602 in 1954. Exports of other horticultural produce from the Province, mainly to the Nairobi market, included 36,030 boxes of green vegetables, 1,120 bags of onions and 143 tons of mangoes. The total recorded sales of vegetables and fruit from the Southern Province was valued at £26,030.

In the Coast Province the principal African vegetable-producing area was the Teita Hills. It is estimated that 789 tons of mixed vegetables valued at £13,250 were exported by the Teita vegetable growers. Yields of bananas were good in Kilifi, Kwale and Voi. The citrus crop was exceptionally good south of Kilifi and cropping continued until August.

Large quantities of mangoes, paw-paws and pineapples were grown and consumed locally or exported to Mombasa.

Wattle.—The production of wattle bark in the Central Province, the principal wattle-growing area in the Colony, increased from 37,511 tons valued at £512,169 in 1953 to 40,450 tons valued at £587,217 in 1954, due to heavier cutting resulting from realignment of land use. It is hoped that yields in future years will be maintained by fresh plantings on lands more appropriate for wattle growing. Generally quality was good except for bark delivered from Fort Hall to Thika,

27 per cent of which was returned to the reserve for regrading. Sales of dry bark from the other African areas in 1954 amounted to 3,941 tons made up as follows:—

						<i>Tons</i>
Nyanza Province	..	..	..	..	..	966
Rift Valley Province	..	..	..	..	..	471
Southern Province	..	..	..	..	..	2,129
Coast Province	..	..	..	..	..	375

The area under wattle on European farms in 1954 was 74,868 acres of which 62,738 acres were in the Uasin Gishu District.

The following statistics were supplied by the Kenya Wattle Manufacturers' Association:—

				1953	1954
				Tons	Tons
Purchased from Africans—					
Dry Bark, F.A.Q.	..	..	..	35,106	33,813
Dry Bark, U.G.	..	..	..	3,423	3,623
Green Bark, F.A.Q.	..	..	..	3,863	3,069
Purchased from Europeans—					
Dry Bark, F.A.Q.	..	..	..	10,505	8,783
Dry Bark, U.G.	..	..	..	348	379
Green Bark, F.A.Q.	..	..	..	3,269	9,800
Total production of extract	..	..		27,230	25,481
Total exports and local sales of extract	..			22,828	25,721
Exportable value (approx.)	..			£1,597,960	£1,769,000

Actual exports of wattle extract increased from 22,091 tons valued at £1,544,720 in 1953 to 24,249 tons valued at £1,668,637 in 1954. Exports of wattle bark increased from 1,805 tons valued at £58,591 in 1953 to 6,766 tons valued at £219,979 in 1954.

Wheat.—The following is a comparison of the actual production from the 1953 sown crop with the final estimate of production from the 1954 sown crop:—

				<i>1953/54</i> <i>(Actual)</i>	<i>1954/55</i> <i>(Estimate)</i>
Area (acres)	..	..	..	289,254	298,163
Total production (bags of 200 lb net)	..	..	..	1,329,605	1,687,436
Average yield (bags per acre)	..	..	..	4.60	5.65
Retained on farms (bags)	..	..	..	111,272	—
Available for milling (bags)	..	..	..	1,218,333	—

Nineteen hundred and fifty-four was a good wheat year and the estimated yield is up by one bag per acre which is most encouraging. Better wheat crops are being reported on land newly broken from grass ley compared with old land on the same farms in Nakuru District. Yields of two to three bags an acre have been harvested on old land adjacent to 12 bags an acre on land broken from first year ley. The guaranteed free on rail price for Grade I wheat from the 1954 sown crop was Sh. 52 per 200 lb. naked.

Livestock Products

Bacon and Lard.—There was a slight increase in the total deliveries of pigs to the factories:—

				1953	1954
Baconers	..	..	..	41,768	40,903
Porkers	..	..	..	11,768	13,259
Larders	..	..	..	3,937	4,453
Total	..	..		57,473	58,615

Butter.—Creamery production increased from 7,411,313 lb. in 1953 to 9,321,023 lb. in 1954 of which 6,567,845 lb. were consumed locally and 2,882,600 lb. valued at £483,117 were exported. The average pay-out for Grade I butterfat was Sh. 3/25 per lb.

Cheese.—Production of cheese by the creameries amounted to 1,244,627 lb. compared with 275,476 lb. in 1953.

Eggs.—Sales of eggs from the African areas decreased from 61,645 gross valued at £62,364 in 1953 to 39,000 gross valued at £40,360 in 1954.

Poultry.—Sales of poultry totalled 226,938 valued at £42,872 as against 355,261 head in 1953.

Hides and Skins.—Exports of hides and skins increased from 99,468 cwt. valued at £1,568,826 in 1953 to 120,984 cwt. valued at £1,836,576 in 1954. Details of export were:—

		Cwt.	Value £
Cattle hides (shade-dried)		48,208	665,748
Cattle hides (sun-dried)		1,828	16,847
Cattle hides (wet-salted)		10,410	76,622
Calfskins and kips (shade-dried)		18,035	2,975
Sheepskins and lambskins (shade-dried)		25,949	609,005
Sheepskins and lambskins (sun-dried)		825	13,348
Goatskins and kidskins (shade-dried)		15,102	440,630
Goatskins and kidskins (sun-dried)		627	11,401
Total	..	120,984	1,836,576

Slaughter Stock.—The following are comparative figures of purchases by the Kenya Meat Commission:—

	1953	1954
European-owned cattle and calves	41,573	48,981
African cattle	19,065	29,710
European-owned sheep and goats	41,571	43,218
African sheep and goats	86,664	105,170

Wool.—Exports of wool decreased from 14,543 centals (100 lb.) valued at £257,100 in 1953 to 12,281 centals valued at £214,530 in 1954.

TABLE C.—QUANTITIES AND VALUES OF EXPORTS OF KENYA PRODUCTS, 1954

COMMODITIES	Unit	QUANTITIES					VALUE				
		1939	1951	1952	1953	1954	1939	1951	1952	1953	1954
CATTLE	Number	—	14	—	—	650	—	132	—	—	£
Sheep and Goats	"	—	770	210	415	304	—	1,034	315	608	33,493
Bacon and Ham	Cwt.	1,376	25,545	24,556	19,851	14,110	9,080	253,660	257,556	223,932	613
Beeswax	"	1,208	399	695	1,145	1,227	5,162	10,144	12,767	21,450	164,300
Butter including Ghee	"	21,277	12,698	23,533	12,584	25,764	90,659	202,318	391,123	239,495	25,985
Cheese	"	652	222	238	137	132	2,987	3,045	3,419	2,175	483,572
Hides (shade-dried)	"	19,245	43,890	42,782	55,780	48,208	53,372	957,637	563,613	798,325	2,355
Skins (Sheep and goats) shade-dried	"	337,082	+26,629	+19,982	25,623	25,949	18,152	773,347	389,099	565,151	665,748
Hides (sun-dried)	"	21,737	10,633	2,450	2,954	—	43,444	208,025	29,611	29,170	609,005
Skins (Sheep and goats) sun-dried	"	1,014,543	+2,442	+1,863	1,664	825	40,900	51,757	24,878	24,861	16,847
Other Hides and Skins	"	—	10,787	6,563	13,447	10,686	—	165,171	57,575	151,319	13,348
Wool	"	15,114	14,688	12,024	14,543	12,281	56,578	379,240	240,689	257,100	214,530
CROP PRODUCE—											
Coconuts and Copra	Ton	215	11 ¹	260	1,880	52	1,561	23	5,169	151,580	1,193
Coffee	Cwt.	338,125	198,759	338,441	295,795	216,126	800,827	4,096,317	7,123,360	6,712,733	5,726,824
Cotton	Cwt.	59,677	38,855	60,505	42,231	61,002	124,021	986,478	1,098,271	511,972	796,041
Sisal	100 lb.	29,163	38,825	35,273	35,334	32,232	442,434	6,948,160	4,468,388	2,482,469	2,041,563
Flax	Ton	16	39	42	87	22	810	9,350	8,240	13,333	3,341
Beans and Peas	Cwt.	123,002	39,609	151,035	42,991	12,873	40,250	70,935	254,627	73,804	38,174
Maize	"	1,007,125	406,471	1,365,478	215,043	918,332	222,037	666,850	2,385,264	306,017	1,013,192
Maize Meal and Flour	"	122,029	16,162	28,353	34,419	5,602	25,450	15,895	64,035	48,367	8,182
Pulses other than beans	"	7,756	16,234	30,611	5,944	—	2,702	35,054	281,949	20,643	—
Wheat	"	973	427,232	147,869	5	—	393	639,017	647,735	11	—
Wheat Flour	"	63,883	254,746	269,037	223,364	103,169	50,655	515,377	7,223	573,545	269,096
Grain other than Maize and Wheat	"	14,618	763	6,811	180	29,994	4,424	878	7,223	533	18,388
Groundnuts	Ton	402	—	6	5	28	4,442	—	403	242	1,317
Cashew Nuts	"	32	73	40	71	925	1,812	22,349	14,005	21,143	21,437
Castor Seed	"	—	—	5,440	4,600	6,267	(a)	(a)	392,463	266,721	253,190
Sunflower Seed	"	477	3,225	4,446	1,496	2,570	3,997	147,797	183,319	65,283	88,925
Coconut oil	Cwt.	33,152	—	+278	43	23	2,346	—	2,371	298	177
Essential oils	"	3,660	+1,420	+526	767	619	4,956	38,489	35,794	30,114	29,896

(a) Previous to 1952, the figures for Castor Seed were included in "Other Agricultural Produce".

[Continued.]

TABLE D.—QUANTITIES AND VALUES OF MORE IMPORTANT PRODUCTS MARKETED FROM
THE AFRICAN AREAS (PARTLY ESTIMATED)

PRODUCE	Unit	NYANZA PROVINCE		CENTRAL PROVINCE		SOUTHERN PROVINCE		COAST PROVINCE	
		Quantity	Value £	Quantity	Value £	Quantity	Value £	Quantity	Value £
Beeswax ..	36 lb.	—	—	414	1,863	3,848	14,058	—	—
Cashew Nuts ..	Ton	—	—	—	—	—	—	1,292	29,716
Cassava ..	Ton	14.5	131	—	—	—	—	—	—
Chillies ..	Ton	—	—	—	—	—	—	455	50,960
Coffee (parchment) ..	Ton	103	35,680	349	176,841	—	—	4	1,400
	Ton	—	—	360	78,022	—	—	—	—
Copra ..	—	—	—	—	—	—	—	—	26,000*
Coriander ..	180 lb.	—	—	—	—	2,553	5,196	—	—
Castor Seed ..	180 lb.	—	—	—	—	51,593	108,496*	1,487*	3,078
Cotton Lint ..	400 lb.	10,154	414,718	—	—	—	—	6,873	372,870
Eggs ..	Number	2,147,430	12,023	2,407,591	20,800	1,060,720	7,547	—	—
Charcoal, Fuel, Poles	—	—	—	—	185,449	—	—	—	—
Ghee ..	36 lb.	29,483	147,079	—	—	405	8,759	—	—
Groundnuts ..	180 lb.	15,579	43,465	—	—	—	—	—	—
Hides ..	36 lb.	—	49,774	17,011	69,090	48,538	37,135	—	—
Kapok ..	lb.	—	—	—	—	—	—	—	2,300
Maize and Maize Meal	200 lb.	1,201,045	1,779,897	74,914	108,515	—	—	29,420	735
Millet and Sorghum ..	200 lb.	107,612	148,114	14,506	18,992	1,582	3,080	10,702	17,000
Miraa (<i>catha edulis</i>) ..	Tundus	—	—	45,315	39,651	—	—	—	—
Potatoes (English) ..	180 lb.	12,788	8,951	57,234	61,476	—	—	—	—
Poultry ..	Head	14,964	2,693	45,943	8,801	166,031	31,378	—	—
Pulses ..	200 lb.	8,667	12,333	71,937	114,348	6,793	20,048	359	680

*Figure incomplete.

Total value of Table, £5,380,745. Corresponding figure for 1953, £3,533,445.

[Continued.]

TABLE D.—QUANTITIES AND VALUES OF MORE IMPORTANT PRODUCTS MARKETED FROM
THE AFRICAN AREAS (PARTLY ESTIMATED)—(Contd.)

PRODUCE	Unit	NYANZA PROVINCE		CENTRAL PROVINCE		SOUTHERN PROVINCE		COAST PROVINCE	
		Quantity	Value £	Quantity	Value £	Quantity	Value £	Quantity	Value £
Pyrethrum	lb.	7,870	747	382,550	38,671	—	—	—	—
Rice (Paddy)	150 lb.	34,675	59,439	—	—	—	—	145	230
Sesame	180 lb.	297	882	—	—	—	—	—	—
Sisal Leaf	Ton	—	—	383	437	—	—	—	—
Sisal Fibre	Ton	—	—	—	—	—	—	—	—
Skins	Score	—	—	21,772	63,974	536	15,030	—	—
Tobacco green leaf	lb.	—	—	1,289,553	41,596	—	40,241*	—	—
Tobacco native cured	—	—	—	—	—	131,865	5,042	—	—
Vegetables, Flowers and Fruit	Ton	No. figs.	No. Lic.	17,148	204,429	—	26,030	—	—
Wattle Bark	Ton	773	10,876	40,450	587,217	375	5,276	—	—
Wheat	200	661	1,371	63	142	—	—	—	—
Total Value, 1954	..		2,728,173		1,820,314		327,289		504,969
Total Value, 1953	..		1,427,675		1,349,487		318,078		438,206

*Figure incomplete.

Total value of Table, £5,380,745. Corresponding figure for 1953, £3,533,446.

PART II—RESEARCH AND SPECIALIST SERVICES

Expansion of the research facilities of the Department, partly financed by a grant from the Colonial Development and Welfare Fund, was continued during the year. The new central laboratories in Nairobi were completed, equipped and occupied by the end of the year. Major development of the new experimental stations at Eldoret, Embu and Matuga had been finished in 1953: during the current year development of the land on these stations continued and a full programme of experimental work was in progress at all three. At Sotik, where a start was made in 1953, most of the building work was completed, the farm plan was put into operation and all rotational fields were under cultivation with the appropriate crops. Land for the main experimental station in Nyanza Province was finally acquired early in 1954 and work has gone ahead on buildings, clearing, farm layout and soil conservation works, but no land was cropped this season.

Funds were approved towards the end of the year, either under the Swynnerton Plan for agricultural development in African areas or under the Colony 3½-year development plan, for expansion of facilities at the grassland research stations at Kitale and Marindas, the provision of two grassland units in the drier African areas, further development of the Plant Breeding Station, Njoro, two sub-stations for coffee experimental work in Nyanza and Central Provinces, two experimental stations for irrigation, and a station for work on tree crops, especially coconuts and cashew, at the Coast. No progress had been made with these projects, beyond reconnaissance and planning by the end of the year.

The development plans also provided for an increase in the establishment of the research and specialist sections from 36 to 54 research officers and in total European staff from 91 to 129. No increase in actual staff employed had occurred by the end of the year—the figures remaining the same as last year at 34 research officers and a total European staff of 91—but a further ten research officers had been recruited and started training. In common with most other activities in Kenya, the research services continued to suffer to some extent from the Emergency, 11 officers being called up for full-time duty with the security forces and a number of others similarly serving part-time.

General Husbandry

AFRICAN AREAS

In areas suitable for more or less intensive mixed farming, which constitute the most important part of the African lands, a good deal of work was continued on ley establishment and management and on the production of dry season fodder. Satisfactory ley grasses are now available for those areas with reasonably good rainfall in Rhodes grass, Molasses grass, Star grass and Nandi *Setaria* (a strain of *Setaria sphacelata*) and their establishment presents no great difficulties, although improvements on existing methods should result from work in progress. Where rainfall is less favourable, the problem of leys and their establishment is not fully solved. Reasonably satisfactory results can usually be obtained in most areas by planting Star grass of *Panicum makarikariensis* and sometimes with Guinea grass (*Panicum maximum*) but seeded grasses have been less certain, although good results have often been obtained with Rhodes, Molasses, *Cenchrus ciliaris* and *Eragrostis superba*. For a wide variety of conditions Elephant grass (*Pennisetum purpureum*) has proved the most productive crop for dry season fodder, and it commonly responds well to farmyard manure and phosphate. To overcome the disadvantage of its low protein content trials are being made with the grass in mixture with a number of legumes.

The assessment of fertilizer responses in the African areas is a matter of great importance and provision has been made for additional staff, comprising a soil chemist, a soil surveyor and three assistant agricultural officers, to intensify work in this sphere. This additional staff is not yet available and little expansion of fertilizer work has been possible during the year. A limited number of statistical trials, mostly on experimental stations or sub-stations, in all Provinces, have continued to show a widespread response to phosphate, and in the Coast Province, response to nitrogen and potash have also been observed. In areas where responses are clear, experiments are in progress to determine optimum rates and frequencies of application, particularly of phosphate and farmyard manure, between which an interaction may be expected. In other areas attempts have been made to start preliminary explorations of fertilizer responses by means of simple trials, usually comprising eight plots for the eight combinations of presence and absence of N, P and K or of N, P and farmyard manure. Over 30 such trials were planted in Central Province but, owing to the unsettled Emergency conditions, few were successfully harvested. Six trials on Magerini sands in Coast Province indicated general response to phosphate on this soil type, and of five trials in the Kisii highlands, three showed response to phosphate, but none to nitrogen.

Factorial experiments on the effect of tie-ridging, mulching and application of farmyard manure on arable crops were continued at a number of sites. In the wetter areas, on loam and clay loam soils, 3 ft. tie-ridging has not been beneficial and has not infrequently depressed yields. Under similar conditions there has been no response to mulching and these experiments are now being discontinued in such areas. In the drier areas (e.g. Machakos District and Coast Province) on lighter soils, the effect of ridging has varied from season to season, while mulching has significantly increased yields on a number of occasions in seasons of particularly unreliable rainfall. It is proposed to continue work at the Coast in order to test 3-ft. ridges against the 6-ft. ridges habitually used in certain localities and to include the comparison of deep burial of crop residues and weeds in the ridges with use of the material as a surface mulch.

In the field of crop improvement, at least two resistant cassava varieties ex-Amani have now performed well at Matuga, both in disease resistance and yield trials, in comparison with local varieties. These are now being tried more intensively in the Coast Province and bulking has been started with a view to distribution on an "advancing front" plan involving replacement of local varieties over a gradually increasing area. Similar work on cassava in Central Province has been held up as the Molinduku sub-station had to be closed for security reasons. Observation plots with a range of groundnut varieties in Nyanza and Coast Provinces revealed some promising types which will be tested in formal variety trials in 1955. A large collection of sorghum varieties was grown in observation plots for the second season at Kibos and Kakamega in Nyanza Province and some of the best will go into a variety trial in 1955. Two years' testing of varieties of wimbi (*Eleusine coracana*) imported from Uganda has shown them to be inferior to local types in the higher parts of Nyanza. Agronomic and breeding work on cotton was continued in Nyanza by an officer of the Empire Cotton Growing Corporation, but the effects of treatment in most experiments were masked by an extremely heavy infestation of stainers. An entomologist began work on cotton pests in Nyanza during the year. Variety and interplanting trials with cotton continued at the Coast and gave indications that S.47 is superior to the rather mixed cotton, chiefly N.17 at present grown.

Work continued on the problem of finding means of effective utilization of the relatively high altitude "bracken zone" of Kikuyu land. Further pot experiments confirmed a need for lime and phosphate and, probably, magnesium, from these soils, but showed that high content of available aluminium and manganese is not

a limiting factor. Field trials again showed response to phosphate and farmyard manure from both crops and grass. Experiments are now needed to determine the optimum rates and frequency of application of lime, phosphate and manure, and to assess the economies of using the two former. Pastures of Kikuyu grass, Molasses grass and Guinea grass have been successfully established with the aid of phosphate and farmyard manure and have remained highly productive over a period of two years. Further work is needed to determine the best method of grass establishment (including rates of application of phosphate, manure and, possibly, lime), the period during which grass will remain productive and methods of maintaining its productivity. Other grasses which appear promising in preliminary trials on this land are Nandi *Setaria*, *Hyparrhenia hirta*, *Paspalum dilatatum* and *P. scrobiculatum*.

EUROPEAN AREAS

Experimental work was carried out on stations at Kitale (6,200 ft.), Eldoret (7,200 ft.) and Ol Joro Orok (7,800 ft.) on departmental plots in Nakuru District at Rongai (6,000 ft.), Njoro (7,100 ft.), Marindas (9,200 ft.) and Londiani (7,500 ft.) and on farms. Much of this work comprised cereal variety and ley trials, conducted in collaboration with the Senior Plant Breed or Senior Pasture Research Officer, and mentioned elsewhere under appropriate headings.

Long-term experiments at Eldoret and Ol Joro Orok to study the residual and cumulative effects of superphosphate, soda phosphate and Uganda rock phosphate were continued and residual effects of all three were observed but results cannot be assessed until further cropping takes place. For the second year trials with five types of nitrogenous fertilizer (sulphate of ammonia, nitrate of soda, nitrochalk, calcium cyanamide and calcium nitrate) on the two main soil types at Londiani, showed that there was no significant difference between them in their effect on the yield of wheat. Further fertilizer experiments on crops and soils not covered by the Highland Fertilizer Scheme, generally showed response to phosphate, but not to nitrogen or potash.

In a long-term study of the effect of liming the more acid soils of the Highlands, factorial experiments involving different types and rates of application of limestone combined with nitrogen, phosphate and potash, were started at Eldoret and Kaptagat in 1953 and at Marindas and Kinangop in 1954. At the first two sites in 1953 response to lime was small but that to potash considerable, whereas in 1954 the response to lime was much greater.

A number of crop husbandry investigations which were continued, or begun in 1954, have not yet given definite results. These include: (a) investigation of the effect of nitrogenous fertilizer on maize at 3½ ft. and 6½ ft. row spacing, combined with interplanting the maize with a legume for grazing off with the stover; (b) the effect of a short-term green manure, with various rates of application of phosphate, preceding a wheat or barley crop in the same season; (c) comparison of undersowing various ley species in wheat with sowing in pure stand or with an oat comparison crop for grazing or silage; (d) trials of a number of silage mixture.

A further trial of feeding Aurofac to pigs confirmed that this antibiotic is beneficial in improving the growth rate of runt pigs enabling them to be carried through to bacon weight at a profit, without any adverse effect on grading, but with normal pigs the beneficial effect is slight and the profit, if any, small. At Kitale and Ol Joro Orok grazing dairy cows on grass which had been mown and wilted was compared with normal grazing and results were in favour of normal grazing, but this result needs confirmation. Long-term work on beef production at Ol Joro Orok, using Boran and crossbred Boran x Hereford and Boran x Angus animals, was continued.

Grassland

During the year 1954 work continued at the main station at Kitale (6,200 ft.) and at the Molo sub-station (9,000 ft.). Useful progress has been made at both places.

In the plant introduction and nursery work, over 300 new varieties and strains of grasses and legumes have been brought in for trial. These have come mainly from the U.S.A., Nigeria, Australia and Southern Rhodesia. The total number of different plots in the nursery during the season was 1,400, and this comprehensive collection facilitates the selection of superior strains of the main species in use, for the wide variety of conditions with which we are concerned in Kenya.

The most important grasses for general purpose leys are still Rhodes grass (*Chloris gayana*) and Molasses grass (*Melinis minutiflora*). Nandi *Setaria* (a strain of *Setaria sphacelata* developed by D. C. Edwards) has proved most promising in extensive trials over the past two seasons, and will probably soon be a third species in general use. As a result of numerous trials on experimental stations and farms, we are now able to make more definite recommendations regarding ley species for different areas or zones. Rhodes and Molasses grasses and Nandi *Setaria* have proved satisfactory under a wide range of conditions from below 6,000 ft. up to about 8,000 ft., and Nandi *Setaria* has done well as high as 8,600 ft. at Ainabkoi. Similarly, further recommendations can now be made for the use of Cocksfoot, Perennial Ryegrass and Brome grass (*Bromus unioloides*) at the higher altitudes of 8,600 ft. and over.

Other grass species under intensive trials are Star grass (*Cynodon plectostachyum*), Guinea grass (*Panicum maximum*) and Signal grass (*Brachiaria brizantha*). In a preliminary trial the Star grass, with moderate dressings of fertilizer, yielded 33 tons of green material per acre. In another trial under grazing conditions Guinea grass has produced even more than this. Signal grass is another promising and drought-resistant species.

Of the perennial pasture legumes, Kenya White Clover (*Trifolium semipilosum*) has been outstanding in preliminary trials from Kitale to Ainabkoi (6,000–8,000 ft.), the strain used in the trials being that originally selected by D. C. Edwards at Kabete. It is to be tested more intensively from now on for use in the high rainfall mixed farming areas and present indications are most promising, judging by its performance to date.

Lucerne is another promising legume which is being studied intensively both for fodder and pasture purposes. It is considered that the productivity of lucerne in Kenya could be increased, and its use considerably extended, by better knowledge of its nutrient requirements and by the introduction of varieties other than those at present in common use. A collection of 72 varieties has therefore been established, some of which appear on initial testing to be superior to those in present use, though it is still early to make definite recommendations. Experiments with fertilizers and manures on lucerne seem to indicate that some of the better responses were obtained from mixtures containing potash, phosphate and cattle manure. With regard to the trace elements, there seems to be a certain unbalance rather than a deficiency, which appears to be rectified by the application of certain of them. So far this has shown up even where the ordinary fertilizers have already been applied. The results, however, are only tentative and require further confirmation.

The fixation of nitrogen by legumes is regarded as one of their most important features in climatic conditions where this is known to occur. In view of its importance in relation to soil fertility and the production from leys under such conditions, it is most necessary to ascertain what the position is under Kenya

conditions. Numerous legumes have been found to fix nitrogen in the laboratory either in sand or other culture media in Kenya, and they have also done so in pot experiments outside. The problem now is to ascertain if it takes place under ordinary field conditions, or whether it can be brought about by means of inoculation with suitable strains of *Rhizobium*, and/or the use of appropriate soil amendments. The first series of preliminary experiments have given a strong indication that inoculation with a suitable strain, together with the application of phosphate to the soil, will improve the growth of certain species of legumes, and in all probability result in efficient nitrogen fixation.

Experiments on herbage seed production have given encouraging results. The average seed yield from Rhodes grass in the Colony is generally in the neighbourhood of 100 lb. per acre, though on occasions twice this has been obtained. In experiments where it was treated with moderate dressings of sulphate of ammonia and double superphosphate, yields of over 4 cwt. of threshed seed per acre were obtained. Row spacing of 5 ft. also appears to be better than 3 ft. spacing, especially in the later harvests. Experiments are also in progress on the seed production of Molasses grass, Nandi *Setaria*, Guinea grass and Signal grass (*Brachiaria brizantha*). These experiments involve various fertilizer treatments, cultivation treatments, broadcast and spacing arrangements and times of harvesting.

Seed multiplication of some of the more important and promising species is also taking place. Twenty-five acres of Nzoia Rhodes grass for seed production were established at Eldoret, while 11 acres of Nandi *Setaria* for seed are in production now at Kitale. Kenya White Clover has produced seed at the rate of over 700 lb. per acre from a third of an acre plot in its first harvest year, while Burr Medic (*Medicago denticulata*), an annual, has produced seed at the rate of over 1,100 lb. per acre. A promising annual red clover, *Trifolium ruepellianum*, which has produced green fodder at the rate of over 20 tons per acre, has yielded seed at 290 lb. per acre.

Ley establishment experiments give the general impression that sowing alone or with a grazing companion crop such as oats gives better establishment of the grass than undersowing in a grain crop. Leys can, however, be established by a variety of methods all of which have given satisfactory results at various times, namely broadcasting, drilling, undersowing, sowing direct, and sowing with a companion grazing crop. But on the whole, the two latter with drilling seem to give more efficient and consistent results from the grass point of view. In one of the experiments in which Nandi *Setaria* was used, a nurse crop of edible lupins gave good results. The lupins apparently produced effective nodules, judging by their size and colour, and the grass in the lupin treatment showed not only a darker green colour, but also better establishment and production.

Dry season herbage production work has mainly been concentrated on the use of Elephant grass (*Pennisetum purpureum*) with and without companion legumes. Guinea grass (*Panicum maximum*) and *Setaria splendida* are also receiving special attention for this purpose. The first two species are bigger yielders, but the *Setaria* seems to be of superior quality. Elephant grass yields from one trial, in tons of green material per acre for the dry season were, January 5.2 tons and November 7.7 tons, with 14.2 tons in the wet season. The addition of sulphate of ammonia at about 4 cwt. per acre increased the yield per annum from 16 to 26 tons, four tons of this increase being obtained in the dry season. The use of old cattle manure gave an increase from 21 tons to 27 tons per acre, three tons of this increase being obtained in the dry season. The greatest increase in this trial was brought about by means of sulphate of ammonia applications plus cultivation, which together raised the yield obtained in the dry season from six tons to nearly 15 tons.

Work at the Molo sub-station (9,000 ft.) tends to confirm the results obtained from last year's spraying trials, in which some success was obtained in preventing Spurrey from smothering the young seedlings of the grass ley by its dense and rapid growth. It seems that four pints per acre of Agroxone 3 is quite adequate for controlling Spurrey (*Spergula arvensis*) in Perennial Ryegrass, which may safely be sprayed at any stage of growth. Cocksfoot is more susceptible, and suffered from that rate of application (four pints/acre) in its early stages before the first tillers had developed. The two indigenous legumes receiving special attention are Kenya White Clover, and the local perennial purple clover (*Trifolium johnstonii*). These are gradually being multiplied up for field scale trials. The use of lime at Molo has produced some striking results on vleis soils. Wheat, grass species and legumes all showed substantial increases in growth with the application of four and eight tons of limestone per acre. Lucerne also responded well. Nodule counts were made and nodules were only found on the lime plots, where 80–100 per cent of the plants nodulated well, and on the phosphate plots where 20 per cent of the plants had nodules. A pasture grass which has shown up particularly well during the season is Westernwolds Ryegrass, which provided grazing nine weeks after sowing, and showed a rapid rate of recovery after grazing. If it repeats this performance in future it may well become a valuable short rotation grass.

The Pasture Research Chemist and his staff have done a lot of routine analytical work in addition to a number of special investigations. Seven papers have been published in various journals and the work covered in these papers comes under the following headings: fertilizer experiments on grassland, the chemical composition of herbs in pasture, a comparison of two nitrogenous fertilizers, the rejuvenation of Kikuyu grass pastures, the composition of green oats for forage and silage, and the use of fertilizers for ley establishment and on established leys and permanent pastures.

Coffee

Entomology.—Breeding of parasites and predators to enhance control of mealybug, *Planococcus kenyae* (Le Pelley) continued. To date the effect of liberations in the field of the species obtained in Uganda in 1951 has not been apparent. Satisfactory control of the ant, *Pheidole punctulata* Moyr, was achieved with dieldrin or chlordane sprayed on the base of trees attacked by mealybug.

D.D.T. dusting experiments against Coffee Thrips, *Diarthrothrips coffeae* Williams, were carried out in order to determine the most efficient filler for such dusts, and talc gave the most satisfactory result. Leafminer, *Leucoptera coffeina* Washb and *L. Coffeella* Guer, sometimes caused serious defoliation and work on the biology and control of the moths was started. Outbreak of leaf-eating caterpillar, *Parasa vivida* Walk, started on some farms in the Thika and Ruiru District but were rapidly controlled by spraying with the paris green/molasses mixture as recommended for control of thrips, or by D.D.T. On one estate the outbreak was curtailed by parasites before much damage was done.

Coffee Lacebug, *Habrochila placida* Horv., continued to be a pest in areas west of the Rift Valley. It was noticed on Mount Elgon and Nandi. Control by using a nicotine/soap spray was achieved, but sprayings had to be frequent. Most planters realized the danger of using a persistent insecticide such as D.D.T. in that the balance between *H. placida* and its predator *Stethoconus* sp. is usually seriously upset and results in a prolonged and serious outbreak occurring.

Green Scale, *Coccus africanus* Newst., was more than usually troublesome in the Thika and Ruiru areas. Satisfactory control was usually achieved by spraying with paraffin/soap emulsion, or by banding the trees as for mealybug

control, to deny attendant ants access to the scale and its predators. The partial failure of the short rains did not assist matters and some outbreaks had not cleared by the end of the year.

Field Trials.—The proposed programme of variety trials which began in 1950 in all the potential and existing coffee-growing areas of the Colony reached the final stage during the year. In Upper Kiambu and Kitale districts three trials of balanced lattice design were planted in which 18 selections of Blue Mountain were included for comparison with other high-altitude varieties. A total of 42 miniature trials of single-tree plots was planted in Nandi, Machakos, Embu, Meru, Nyeri, Kiambu and Makuyu districts. In contrast to the foregoing the two trials planted in Solai district in 1951 had to be concluded. Unfavourable circumstances due to the Emergency and poor rains in 1952 and 1953 led to a high mortality rate; a census of the two trials showed that the Harrar types, SL.28 and SL.34, were superior to the rest and in this respect our choice hitherto of SL.28 and SL.34 for Solai is fully supported.

Work undertaken in 1953 on methods of applying copper sprays to coffee trees indicated that the low volume, "air-blast" type of sprayer produces a superior underleaf cover. These indications were subjected to the final test in a long-term field trial which was laid down in May at the Coffee Research Station, comparing the "air-blast" sprayer with the standard high-volume, high-pressure sprayer for effect on seasonal leaf-fall and crop. Whereas all previous trials have employed hand-operated lances to apply the spray, in this trial spray concentrations and rates are compared directly using power-driven, tractor-drawn machines. The range of conditions under which "tonic" sprays are being tested was improved by the laying down of a small trial at the Makuyu sub-station; in this three types of spraying are compared at the recommended 2 per cent strength.

A negative interaction in the application of sulphate of ammonia with grass mulch was first detected in 1951. The investigation of this interaction was continued and extended during the year with the initiation of a new field trial in which the main effects and interactions of dressings of sulphate of ammonia (at 0, 3 and 6 cwt. per acre) may be determined when applied to bare soil or to grass mulch laid at three levels. Two field trials which have been operated at Kitale since 1950 have shown inconclusive results on the relative value of an annual one hundredweight dressing of sulphate of ammonia applied to mulched coffee.

Trials commenced in 1954 to investigate the possibility of food and grass production from vleis by the use of a suitable drainage system aided by dressings of manure and fertilizers. A cambered bed system was constructed to facilitate surface and sub-surface drainage. Yellow Durum maize was planted on the raised beds and the following manurial treatments were tested in a factorial trial: nitrogen applied as sulphate of ammonia at 2 cwt. per acre, phosphorus as double superphosphate at 1 cwt. per acre and cattle manure straight from the pens at 20 tons per acre. A big response to the latter was obtained and a good response to both N and P fertilizer occurred; there were no significant interactions between single factors.

Pathology and Physiology.—Investigations on anti-leaf fall spraying have again received the greatest attention. The trial of rates and concentrations at Solai was continued and the yield results show a reversal of those of last year, but the effects were smaller. This is no doubt the result of the heavy crops induced by spraying last year.

A similar trial is now being carried out at Kitale which differs only in having one extra replication. The yields for the first year, 1952–53, show only a significant interaction for copper per tree and rate, suggesting that 2 per cent at one pint

per tree is superior to 2/3 per cent at three pints. In the second year, there was a significant effect of time, spraying in May being superior to June at the 5 per cent probability level and to September and no spraying at the 0.1 per cent probability level. There were no significant effects of rate, copper per tree or interactions between these.

Fungicide-producing firms have expressed concern about the different concentrations advised by us for cuprous oxide as opposed to copper oxychloride formulations. The differences, although of commercial importance, are not large, but an attempt to measure them has been made in a factorial experiment comparing the effects on leaf fall of 21, 42 and 64 oz. per 40 gallons of Perenox, Cupromox, Cuprokylt and Blitox. The results are rather complicated and their interpretation has not yet been completed. There was a tendency for a change of the effect of concentration after the first three months following spraying. Confining attention to the two oxychloride sprays, the trends were for the 42 oz. concentration to control leaf fall either as well or better than the 64 oz. rate, although the differences were not statistically significant. The same was true of Cupromox and one time of application of Perenox which was before heavy rain, but the other applied later behaved anomalously.

A further attempt was made to determine whether copper tonic sprays work through the upper or lower surface of the leaf by following leaf fall from branches with Perenox painted on the upper, lower or both sides of the leaves, or applied to the branch alone as against no painting. As in 1951, some of the treatments increased leaf-fall instead of decreasing it, application to the lower surface, or to both lower and upper surfaces being effective in this respect. It appears that painting is not a satisfactory method of application perhaps due to an excessive amount of fungicide being applied and its phytotoxic effect outweighing the beneficial.

A field trial has been set up at the Coffee Research Station to determine whether leaf-fall control by a non-copper fungicide (Fernide) or by hormones, can lead to increased yields and if so to what extent compared to normal copper spraying. It also includes a test of a second copper spraying at the beginning of the short rains and of dusting. Fernide has so far been found in this trial to control leaf fall to the same extent as 2 per cent Perenox, but dusting has produced very little control.

Testing of the cover produced by various methods of spraying and dusting using the Rubeanic print method has been carried out. Dusting produced a very poor cover. Air-blast spraying at 30 and 60 gallons per acre was found to produce a better cover than high volume spraying at 120 gallons per acre, especially as regards the inner leaves of the tree.

Attempts to discover the organism responsible for weak-spotting using a coffee bush enclosed in a glass house have been unsuccessful when using washings from trees affected with weak-spot as an inoculant.

Work on Leaf Rust (*Hemileia vastatrix*) has included monthly estimation of its occurrence in Makuyu and inoculation tests at Ruiru to discover the time taken between infection and sporing at different times of the year. This appears to be from 4-5 weeks normally and up to 7 weeks in cold weather.

A yield trial of the effect of control of growth by Maleic hydrazide by spraying in June, August and September at 0.2 and 0.6 per cent has been commenced on a Cherangani Estate.

Work on Coffee Berry Disease has largely been in abeyance but with the continued inability to obtain a special investigator for this disease, a preliminary trial of three concentrations of a possible sub-systematic fungicide has been carried out with fairly encouraging results. A survey of the occurrence of the disease this season was also carried out.

Growth recording at the Scott Laboratories and the Coffee Research Station has continued, the plots for comparison of multiple and single-stem pruning now being operative.

Elgon die-back has received some further attention consequent on its presence in both the Kiambu and Solai areas. It would appear that carbohydrate deficiency is not the cause of this disease and in view of certain findings, the question of whether a pathogenic organism may be involved should be re-examined.

Agricultural Chemistry.—Experimentation was completed for the diagnosis of the coffee leaf symptom termed green-vein chlorosis. This condition can be corrected by a single spray application of ferrous sulphate, and it is the result of a deficiency of available iron in the plant. It is not possible to say positively that this condition arises because of a lack of available soil iron at times of rapid vegetative growth, but this is quite probably the case. A manganese-induced iron deficiency has been postulated for other crops on the Kikuyu red loam soil type. It is of interest to note that a modified half-leaf virus scarification technique proved to be an extremely satisfactory method of applying micronutrients for diagnostic purposes.

The main investigation into soil nitrogen status and nitrogen nutrition of the coffee tree has not been fully initiated to date. During the 1953 short rains topsoil samples were collected in one of the nitrogen trials on mature single-stem coffee for the determination of nitrification trends. In March, 1954, soil sampling at depth intervals to 2 ft. were commenced in mature, unmanured multi- and single-stem coffee to determine the general topsoil nitrification trends with season. The nitrate nitrogen results to date exhibit generally well-marked seasonal fluctuations which there seems little reason to believe will differ greatly from one year to the next. With this general information established it will be possible to interpret more satisfactorily the importance of variations induced by soil treatments. One interesting observation which has emerged from the investigation so far is the general difference in nitrate and ammonia nitrogen which has been found in the soil under single and multi-stem coffee trees. It seems to be a difference of degree, not of general trend.

Work has been continued on the determination of the quantities of plant nutrients removed by Napier grass grown as coffee mulch, and of the quantities of these nutrients applied indirectly to coffee on an annual basis as an alternate inter-row mulch. The quantity of potassium taken up by this crop indicates luxury consumption. A chemical study of the soil brought to the surface by termites when active in Napier grass mulch has been undertaken. These termites (*Termes Badius*) have been observed to hasten the decline of the effective mulch life in coffee and if it is proved that during their activity they deposit on the topsoil surface, quantities of acid, base deficient subsoil (on the Kikuyu red loam soil type) then a further black mark must be put against them. In fact, however, results to date do not support this supposition with regard to the soil being poorer in bases than the topsoil.

As an initial stage of the investigation into the artificial drying of parchment coffee a study was made of basic laboratory techniques for determining the true moisture content of both parchment and green, clean coffee. A successful vacuum

oven technique was adopted after the comparison of several standard techniques and a consideration of more recent chemical methods. This method has been used as a routine check on rapid determination of moisture in the field.

A chemical study of soil pH relationships on the Kikuyu red loam soil type supporting a coffee crop, and the effects of the fertilizers and manures applied to the crop has been undertaken. One rather obvious recommendation which arises from this is that as sulphate of ammonia fertilizer substantially reduces the pH reaction in the immediate topsoil (0-3 in.) and as the pH reaction increases in the next three-inch soil layer (3-6 in.), routine annual applications should be distributed over as large an area of soil surface as is consistent with the distribution of the feeding coffee root system.

An interesting observation has been recorded on the coffee-leaf content of manganese under conditions of very heavy cattle manure application to a Kikuyu red loam soil in the lower Kiambu area. Comparative leaf analysis showed the presence of twice the concentration of manganese in the samples taken from the manured area. Field observation made during the long rains at the time of sampling showed a much greater rate of growth as determined by the number of new pairs of leaves produced.

Pyrethrum

Breeding.—The number of single plant selections was greatly reduced as it was thought that a sufficient quantity of clones had been tested and found promising for further breeding work. Only outstanding plants within hybrids produced on the different stations were selected. Altogether 272 clones were under observation and 243 tested. Promising clones were bulked up either to be used for crossing or to be issued to growers direct. No new crosses (hybrids) were made during this year owing to the lack of bio-testing facilities. A series of trials studying the problems of pollination and seed setting was undertaken. Most of the new hybrids and some clones were tested in 15 yield trials placed over a wide range of the pyrethrum-growing areas. C.43, C.51, C.79 and M.9 continued to show promise. Work on the breeding system conducted on the lines of sugar-beet breeding was continued at the higher and the lower altitudes. Preliminary tests were undertaken with the most vigorous clones originating from Dalmatia. Seed production fields of C.43, C.51, Molo Bulk and Subukia Bulk were maintained.

Bud Diseases.—The incidence of the fungus *Ramularia bellunensis* gave no cause for alarm although the disease could be observed in most areas. Mainly at the Molo Experiment Station another fungus, *Aschyta*, has made its appearance for the first time this season and caused a certain amount of damage. Preliminary spraying trials with copper solutions had no effect on the growth of the parasite. It has not been very widespread over commercial plantations and further observations will be necessary before more can be said about the seriousness of the disease. A small cutting-back trial gave indications that the incidence of *Ramularia bellunensis* is greater in plots which had not been cut back at all.

Weedkillers.—No satisfactory results were obtained in a number of trials with weedkillers as all chemicals damaged the pyrethrum when applied at a rate adequate to kill weeds.

Stripping Trials.—A large trial was started which compared stripping down to "buds", "petals vertical" and "petals horizontal" at two, three, four and six weekly intervals. It was not possible to test the insecticidal value of the different stripping samples obtained but according to purely chemical analyses no losses in pyrethrins occurred through stripping down to buds at four and six weekly

intervals respectively. At two and three weekly intervals, however, this treatment had a detrimental effect and the highest yields of flowers and pyrethrins were obtained by stripping down to and including flowers with horizontal and vertical petals at an interval of two weeks.

Fertilizer Trials.—The number of experiments with phosphatic fertilizers and farmyard manure was extended. In several big areas yield increases were achieved through the action of superphosphate, either placed in the planting holes or underneath a ridge on which the pyrethrum was planted. In one trial laid down in 1952 the effect of 300 lb. per acre Triple Superphosphate applied below the ridge continued into the third season.

Sisal

During the long rains three new exploratory fertilizer trials were planted on sisal estates at Voi, Ruiru and Kampi-ya-Moto and two new herbicidal trials were started at the Station in co-operation with Messrs. Plant Protection Limited. A fertilizer trial to ascertain optimum rates of applications was planted at the Station during the long rains. There are now 29 trials in progress with a total of 1,360 plots, containing almost 28,000 individually recorded plants. Twelve of the trials are sited on estates ranging from Voi to Kitale, in order to gain information on the requirements of sisal growing under various conditions of soil and climate.

The planting material trials indicate that graded planting material of a size as big as it is economically possible to transport to the fields will give a return sooner, by cutting down the uneconomic period from planting to first cut. Bigger plants are also likely to enhance the financial return by reducing the number of leaves needed to produce a ton of line fibre.

The plant management trials, especially the complex external spacing and cutting trials, demonstrate that the space between plants in the row is more important than the distance between rows. This is indicated by the fact that, for a given population, plants produce leaves faster in the 11-ft. spacings than in the 14-ft. spacings. These trials also indicate that yields generally increase with increased populations up to about 2,000 plants per acre and that the higher populations do not cause any appreciable reduction in leaf length. It is also of interest to note that in a trial, to compare single versus double-row planting at the Station, which is almost three years old, the double-row planting has produced leaves slightly faster and longer than the single-row planting. The earliness of the first cut has a marked effect on the subsequent performance of a sisal plant; it does not appear to interfere with the rate of leaf production, but a too early first cut can retard the natural increase in leaf length and in consequence increase the number of leaves needed to produce a ton of fibre. The intensity of cutting affects the length of leaves produced subsequent to any cut and results show that it is possible not only to retard the natural increase in leaf length, but actually to reduce the leaf length by too heavy cutting.

The cultivation trial, which compares clean weeding with the planting of grass strips between the sisal rows, has now been growing for four years. So far all the treatments have produced similar results and they have yielded about two tons of line fibre per acre.

In the field fertilizer trials, sisal waste has consistently given results better than any of the inorganic fertilizers. Sisal waste which was applied before planting reached the peak of its influence on leaf production during the first year and on leaf length during the third year. The plants continue to produce leaves considerably longer than those planted without sisal waste although the effect is now gradually wearing off. The effect of calcium on leaf count has been small, but it

has had a greater influence on increasing leaf length. Nitrogen has had a small and transitory effect on leaf count and leaf length. Phosphates, which were applied at the time of planting, gave the sisal an initial boost. The effect on leaf count was noticeable within the first six months but it wore off within 18 months. A later application of phosphates applied at the age of three years has so far had no effect on leaf count. The effect of the initial application on leaf length was apparent for the first three years, reaching a peak about 18 months after planting and gradually wearing off in about three and a half years. The second application at three years caused an improvement in leaf length although it was of a lower order than that caused by the initial application. Potash has had a slightly depressing effect on growth although the effect has not been statistically significant. All treatments with the exception of potash have reduced the number of leaves required to produce a ton of line fibre. It is not yet known whether the improvement in yields would justify the expense involved in the addition of sisal waste and fertilizers.

A comparison of Agave hybrids and local selections is being made with common sisal in an endeavour to find a plant that may be better than common sisal. These have not yet been cut, but the hybrids are producing leaves more quickly than common sisal, whereas the latter is producing a longer leaf.

Herbicidal sprays are being tested, as the control of weeds and grasses, especially in the rows of young sisal, is an important factor in the development of sisal. Weeding of the rows is done by hand labour and it is seldom possible to control weeds at the right time by this means on a plantation scale. Some success has been achieved in the control of "couch", *Digitaria scalarum*, by using sodium trichloroacetate as a pre-emergent spray before planting sisal.

Sugar

Results from further variety trials in the Kibos-Miwani area of Nyanza Province have provided further indications that several other CO varieties are higher yielding than CO.421, which, as a result of previous work, has now largely replaced CO.281, formerly the chief variety grown. The best varieties in recent trials are CO.331, CO.213, CO.419 and CO.409, while CO.453, CO.411 and N.CO.310 are also promising. In the East Konyango location of South Nyanza, where sugar cane growing by Africans is being started, a variety trial planted in 1952 was harvested and gave the satisfactory average yield of 48.2 tons of plant cane, and 10.9 tons of tops, per acre. Variety yields could not be accurately assessed in this trial owing to errors at harvesting causing admixture of varieties, but observations indicated that CO.421, CO.419 and CO.331 were satisfactory varieties for the area.

Fertilizer trials were started at Miwani (Nyanza) and Ramisi (Coast Province) in 1952. The first trial, a 3³ NPK factorial experiment, was conducted at both sites. At Miwani there were no significant responses to any fertilizer in the plant cane crop, and the ratoon crop, for which fertilizers were reapplied, has not yet been harvested. In the plant cane crop at Ramisi there was a marked and economic response to phosphate at 1 cwt. double-superphosphate per acre but no significant increase from a heavier dressing of 2 cwt. double-superphosphate per acre, while nitrogen gave significant responses to both 2 and 4 cwt. sulphate of ammonia per acre, the response to the higher level being significantly greater than that to the lower. In another experiment at Ramisi 0, 3 and 6 cwt. sulphate of ammonia per acre was tested in combination with either 3 tons of molasses or 10 tons of filter press mud per acre. Significant responses were obtained from filter press mud plus 6 cwt. sulphate of ammonia, which yielded 49 tons of cane per acre, and filter press mud plus 3 cwt. of sulphate of ammonia (39 tons cane per acre), compared with control plots which yielded 30 tons of cane per acre.

Horticulture

Some reorganization of the work of the horticultural section was necessitated by the changing economy of some of the crops dealt with. Long-term work on deciduous fruits is to be maintained but will not be increased more than is absolutely necessary, the reason being that these crops, although necessary for local consumption and even export on a small scale, are not likely to prove very important in the horticultural economy of Kenya. The small station at Ol Joro Orok was closed down at the end of the year as its situation has not proved to be really representative of either a deciduous fruit or a sub-tropical fruit area.

Owing to the possibility of obtaining large export contracts for tomato purée, a considerable amount of time has been spent on conducting tomato variety trials in the districts which were considered most suitable for commercial production. The trials were designed to reproduce large-scale methods of cultivation and to reduce the cost of production to a minimum. The trials are still in progress. Results to date indicate that tomatoes could be produced at an economic price for processing in the Trans Nzoia District, but only if grown under irrigation.

Many pineapple trials in progress in the Thika area and at the Coast were continued. Two new major trials were started at Thika to test the reaction of pineapples to ridge planting on vleis soils, fertilizer treatments being included. The most important observation made in the Thika trials during the year was on the effect of mulch on second-cycle land. In the second fertilizer trial at Karamaini Estate, mulch has had a depressing effect on growth, except when combined with dressings of sulphate of ammonia at the rate of 2,040 lb. per acre. The effect is probably due to a drain on available nitrogen caused by breakdown of the mulch. This is contrary to observations made on trials at Kilifi where mulch has had a beneficial effect on growth in all treatments. It is considered that a large potential exists for the production of canning pineapples in Nyanza Province. For this reason, nine pineapple trials have been started to test the area lying within a radius of 50 miles of Kisumu where a cannery could be operated. It is probable that the best quality fruit for canning will be produced at around the 5,000-ft. level.

A preliminary trial of chemical thinning of plums, using A.N.A. and tar oil sprays, has not given promising results. Thinning of the branches and fruiting wood during winter pruning, which was tried at the same time, appears to be a better way of improving fruit quality but further trials will be needed to confirm this.

A bulk importation of Cambridge Early Pine strawberries was made in April. The plants runnered and have multiplied well during the quarantine period. The plants made good and healthy growth, and it was not until the end of the year that a few plants were seen to be growing symptoms of virus infection. Distribution will be made to growers and nurserymen during April, 1955.

Owing to the erection of a fruit cage at Molo, it has been possible to record accurately the yield of Youngberries for the first time. The crop is still in progress but it seems likely that the yield will be in the region of 4,000 lb. per acre. With the fresh market price of two or even three shillings per lb. the return is a very high one.

As a result of observations made on citrus at the Coast during the last few years, it has been decided to slow down the planting of budded trees in favour of seedlings, and to carry out a survey of existing citrus in the area.

Plant Pathology

Investigations on *Ramularia* disease of pyrethrum were continued. Further alleged resistant clones were received for testing with cultures of the fungus. An especially designed and built climate-controlled chamber is now in operation. A new disease also affecting buds but apparently not flowers has appeared west of the Rift Valley. Certain clones resistant to *Ramularia* have been severely attacked. The causal fungus is a species of *Ascochyta*.

The blight-resistant potatoes received in 1953 have been further tested and multiplied at high-altitude stations. No new forms of blight have been identified. Importations of small samples of stock seed of recent varieties from the United Kingdom have been made.

Ratoon stunting in sugar cane has been identified by Dr. Storey from the Nyanza Province but he was unable to demonstrate the presence of chlorotic streak from suspected material from the same area.

An outbreak, suspected to be that of the Argentine Sunflower virus disease, occurred in two localities. No spread of the disease took place and confirmation of its identity is lacking.

The work on legume nodule bacteria has been expanded and a service for the distribution of cultures organized. During the year 1,603 units, each for the treatment of 20 lb. of seed, were issued, those to the public on payment of one shilling for each unit. Emphasis is now placed on the isolation of local strains of bacteria for each genus of indigenous pasture legumes. A detailed investigation into the causes of frequent failure of legumes to nodulate in certain areas is in progress.

In the seed-testing laboratory 907 samples were tested. In addition to routine tests special tests were done in connexion with the different behaviour of mature and immature seed of Abed Kenia and Herta barleys on soil and sand sub-strata. Tests were also done for the Entomological Section on seed treated with insecticides and for the Grassland Research Station on grass and legume seed, mechanically treated to encourage germination, and on the effect of fertilizers on the germination of Rhodes grass seed.

Entomology

The Barley Bulb Fly, *Hylemyia arambourgi*, did considerable damage to barley during the year. An investigation into its bionomics and control was begun.

An experiment on the control of the stalk borer, *Busseola fusca*, in sorghum demonstrated that the crop can be protected by the use of D.D.T., Endrin or Isodrin.

Work in Nyanza was concentrated on cotton. Regular counts of the chief pests were made on selected plots throughout the Province and progress was made towards correlating these figures with crop loss. Spraying early planted cotton with mixed D.D.T. and B.H.C. has given large yield increases at three places on the Kano Plain, where *Lygus* and *Dysdercus* spp. are the main pests. A trial using B.H.C. to protect young sugar cane from termite attack showed promise.

Extremely good control of *Calandra oryzae* was obtained by farmers in cribs using the recommended treatment of 8 oz. of 0.5 per cent gamma BHC dust to 9 cu. ft., being 12½ parts per million. In further crib experiments it was shown that good protection could be obtained at half this dosage, if the dust were evenly applied. Insecticidal resins containing BHC, DDT, Aldrin and Dieldrin spray-painted on the walls of a store were tested: the best, containing 2 per cent BHC

and 20 per cent DDT, was fully effective against *Calandra* and *Tribolium* for at least six months. Experiments were begun on the control of infestation by various stored products' insects existing in empty railway trucks.

Trials of insecticides against Bean Bruchids were again carried out but observation confirmed that field infestations are too slight to warrant treatment.

Progress continued on the systematic study of East African Coccidæ. An identification service is now available for other East African departments and territories. A detailed study and revision of the African Pseudococcidæ in collaboration with the Commonwealth Institute of Entomology, London, was begun.

The biological control of *Othezia insignis* by *Hyperaspis jocosa* has resulted in a great decrease in the pest.

The Tingid bug *Teleonemia scrupulosa* from Hawaii was reared in satisfactory numbers and many liberations made on stands of the weed *Lantana camara*. Its establishment in the field has not yet been confirmed.

Soil and Agricultural Chemistry

LIME STUDIES

Continuing the lime studies initiated in 1953, the laying down of the full programme of trials forming the basis of the project was completed and detailed laboratory examinations on soil, leaf and grain samples from the trials were undertaken. Nitrogenous fertilizers had no effects on grain composition. Liming brought about a considerable increase in leaf calcium, a slight increase in grain calcium and slight decreases in leaf manganese and aluminium: leaf magnesium was increased when the limestone used had a high magnesium content and was decreased when the limestone used had a low magnesium content. Muriate of potash application led to marked increases in leaf potassium and silicon and to decreases in leaf calcium, magnesium and manganese. Superphosphate application led to a slight increase in grain phosphorus, the increase being accentuated by lime application. The anticipated growth responses to fertilizer and soil amendment application once again were recorded and in addition, induced resistance to leaf rust through potash application was observed.

SOIL ORGANIC MATTER STUDIES

Further survey studies on soil organic matter in relation to cropping history are being undertaken on samples collected in Trans Nzoia. These are in preparation for the designing of critical soil fertility maintenance trials in the Kenya Highlands.

KIKUYU BRACKEN ZONE SOIL STUDIES

Investigation of the acid (ph. 4.7) soil of low inherent fertility from the Kikuyu "Bracken Zone" on which a striking lime effect was observed in 1953, was continued. Early growth of Sudan grass showed a progressive improvement with increasing pH up to pH 5.5 but not beyond. Even though the soil has a very narrow exchangeable calcium exchangeable potassium ratio, the improvement was as good with potash as with slaked lime as the neutralizing agent. Over a period of seven months the difference between growth on the amended and on the unamended soils evened out and the main ultimate response recorded was to phosphatic fertilizing rather than to acidity correction. Further soil studies and leaf studies with beans indicated that poor growth on such soil was due to gross deficiency in available calcium and to deficiencies in phosphorus and magnesium rather than to the presence of toxic concentrations of available manganese and aluminium.

VOLCANIC SKELETAL SOIL STUDIES

Studies were started on a skeletal soil of volcanic origin on which small-grained cereals have shown abnormal and poor responses to phosphatic fertilizing. Marked responses of wheat in pots were recorded to soil copper applications equivalent to 40 and 200 lb. copper sulphate per acre, particularly where phosphates were applied. Zinc similarly applied as zinc sulphate produced no effects. No effects were obtained by spraying application of a wide range of trace element combinations. While confirmation has thus been obtained of an early observation that copper deficiency is implicated, further research into the nutrition complex involved and into correction technique is still required.

SOIL SURVEYS FOR IRRIGATION PROJECTS

There was a considerable intensification in the investigation of irrigation projects. Soil surveys and field trials were initiated in areas for which outline projects already exist and other possibilities were reconnoitred. In collaboration with the Soil Survey Division of E.A.A.F.R.O., preliminary classifications of the soils of Nyanza Province and of part of the Nakuru District were completed and some progress was made by field officers in these areas in the preparation of soil maps.

ERADICATION OF PRICKLY PEAR

Formulations of D.N.O.C., T.C.A. and 2,4,5-T applied in accordance with manufacturers' recommendations all proved effective for the destruction of prickly pear. However, while the damage these herbicides inflicted was great and while the effects have been lasting, in no instance has a single application led to complete destruction of the infestation treated.

Plant Breeding and Selection

Cereal breeding and testing continued at the Plant Breeding Station, Njoro, and on other departmental stations at Molo, Ol Joro Orok, Eldoret, Kitale and Rongai.

Most important for the wheat work was the confirmation of the appearance of two new physiological forms of stem rust, forms K13 and K14, which were first isolated in 1953 but were unconfirmed. Once again form K9 was prevalent in Kenya and Tanganyika, but this year K11 was identified more frequently than K12; in addition K10 and K14 also appeared quite often, the latter being particularly prevalent on a range of new varieties under multiplication. In general, stem rust appeared later than usual and was only severe on late-sown crops in the higher areas. On the other hand, Yellow Leaf and Ear Rust was widespread and did considerable damage, especially to the wheat 341. It now seems certain that different forms of this rust occur in Kenya, but unfortunately it is not yet possible to tackle this problem.

The Plant Pathologist, posted to Njoro in 1953, was mainly occupied with rust work directly in support of the wheat breeding, but also carried out certain other investigations. One hundred and nineteen wheats were tested for seedling resistance to stem rust forms K9 to K14, some 80 identifications of rust form were made, and over 100 specimens of diseased cereals were the subject of report. Many of these latter were wheats infected with Take-All which was very prevalent this year, having much increased in recent years. It is now widespread and serious. In addition, the disease caused by the fungus *Pyrenophora tritici-repentis* was found in many areas and did serious damage in some cases. Control of both these diseases depends upon proper rotational cropping; their prevalence is the direct outcome of wheat monoculture. Unless balanced rotational farming is adopted these diseases will take ever greater toll of the crops in the higher wheat country.

To obtain wider sources of rust resistance, considerable exchange of breeding material now takes place on an international scale and, as part of these co-operative efforts, the International and the Near East Wheat Nurseries were grown at Njoro, over 800 wheat varieties in all. Many of these have been taken for further study, as being of potential value to the Kenya work. It is notable that a high proportion of varieties in these nurseries derive from a Kenya parentage. The Kenya wheats 117.A and 338.AC.2.E.2 have been of particular value to breeders in North America, and the latter variety has now been named Kenya Farmer in response to a request from Canada. (*Canadian Journal of Agricultural Science*, Vol. 34, No. 5, 1954.)

The work of wheat selection continued at Njoro and Molo, and yield trials were also sown at various outstations. At Njoro 58 crosses (F_2 to F_6) were run on the pedigree method and an additional 114 F_2 s and F_3 s were run as selected bulks to give a wider choice of material. At Molo, two crosses were continued in the cage; their first field plots were sown this year and certain of them showed considerable promise.

In spite of the setbacks from drought in 1953, the quantity of material with farmers and on Government stations was greater than ever this year; there were 85 cereal varieties under field scale multiplication on a total of some 1,500 acres. The wheat variety 261.E was released at the end of the year and it is probable that two or three other varieties will also be released in time for the 1955 sowings; three 359 selections due for release were discarded because of stem rust attacks chiefly by K14.

Severe attacks by the fly *Hylemia arambourgi* damaged barley at Njoro; the larvæ eat out the centres of the tillers. In spite of spraying, a considerable loss of plants occurred and the trial and multiplication plots yielded poorly; the vigorously tillering Scandinavian varieties recovered the most successfully. A number of these varieties are being multiplied and, amongst these, Carlsberg did particularly well in spite of fly damage. Proctor, now very popular in Britain, was badly set back by the fly but there are now four bags for sowing in 1955.

By growing crops out of season, the barley crosses made in 1953 advanced to F_2 by the end of 1954 and the F_3 s will be sown in the normal season in 1955.

Work on oats was concentrated at Molo, to avoid the severe rusting that occurs at Njoro; 57 varieties were under test there. Of the varieties under multiplication, Vikota was outstanding this year and gave over 19 bags per acre near Eldoret. At Njoro 3003.F again looked very promising, but became badly attacked by Crown Rust. The varieties RL 1734, Vichland, Vikota and Cedar all did well at Kitale. A number of promising varieties are now nearly ready for release and offer alternatives to the old varieties Grey Algerian and Lampton.

The maize programme at Njoro was a makeshift to try to repair the damage of the droughts in 1952 and 1953, particularly the latter. The first synthetic, lost in 1953, was remade in slightly changed form and multiplied to some three bags of seed. The basic inbreds were in some cases the subject of purification, the remainder being used for crossing work. The wet conditions at tasselling time caused poor sets of seed this year, especially amongst the more inbred material, and consequently the crossing programme was not successful. Of the 310 lines for inbreeding, material from about 100 was selected for further work; in addition, about 200 selfings were made in the "No. 1 Station Selected" maize to give lines for a further cycle of maize improvement based on the use of synthetics.

The maize work at Kitale consisted of a large trial of top-crosses to find the most suitable lines for use in compounding synthetics, and of a crossing programme using 11 fixed inbreds in all combinations to give single crosses for trial in 1955 for double-cross yield prediction. This crossing was more successful than at Njoro and, where certain combinations failed, this may be seen to be due to the inbreds concerned and not the general technique.

The breeding of maize for resistance to *Puccinia polysora* continued at the Coast and consisted of the top-crossing of various homozygous and heterozygous lines to a local coast maize to obtain material adapted to local conditions.

PART III—FIELD SERVICES

Progress in Improved Farming

EUROPEAN AREAS

The standard of farming in the Highlands continues to improve and there is a definite swing away from cereal monoculture. The increase in grass leys, fodder production and stock product yields is evidence of this. The continued firm demand for stock products and the tendency for cereal prices to decline is reinforcing the trend towards a more balanced farming system.

A sharp rise in the acreage of cultivated grass leys was recorded in the Rift Valley Province during 1954. The increased area amounted to 33,292 acres most of which was sown in the Nakuru and Trans Nzoia Districts. The position has now been reached where there is now one acre of ley for every six and a half acres under crop, but there is still some way to go before an ideal balance has been reached. Most of the increase in grass ley acreage has taken place in areas below 7,000 ft. but much more could be done in the Uasin Gishu and Naivasha areas with Rhodes grass than is being done at present. The grass seed supply has improved during the year and should meet the demand. In the higher areas of Nakuru District (8,000 to 9,000 ft.) several farmers have planted a limited acreage of grass ley. One farmer in particular has shown that first-year ley in this zone is extremely productive and encourages good milk yields but second and third-year leys are still very poor. The utilization of leys has improved and where this has been the case on individual farms returns have compared favourably with those from wheat.

As in 1953 there was an increase in the number of cattle on European farms in all districts of the Rift Valley Province. In the Uasin Gishu and Ol Joro Orok Districts butterfat production has risen by 186,000 lb. and 120,000 lb. respectively. The total butterfat production for the European areas of the Rift Valley Province stands at 7,051,000 lb. and 1,175,000 gallons of fresh milk was delivered to the creameries.

Beef production has not increased to any extent during the year, milk giving a better return per acre. Excluding deliveries to small butcheries, nearly 31,000 head were sold for slaughter. The production of mutton and wool still remains mainly in the hands of the Lowland ranches and the high country hill farmer. Approximately 12,000 head of sheep were sold for slaughter during the year excluding deliveries to small butcheries. Profits from pig-keeping remained a controversial subject and appeared to be directly related to adequate supervision.

The movement towards rotational mixed farming was again financially reinforced by the issue of further loans from the Agricultural Lands Rehabilitation Fund. Up to the end of the year 537 loans had been approved for sums totalling

£758,068. Of this sum about £503,330 was lent for the purchase of cattle and most of the rest for the installation of water supplies, fencing and farm buildings. The details were as follows:—

LOANS APPROVED FROM AGRICULTURAL LANDS REHABILITATION FUND TO
10TH DECEMBER, 1954

Districts	No. of Loans	Cattle	Small Stock	Fencing	Water Supplies	Bldgs.	Machinery	Various	Total
		£	£	£	£	£	£	£	£
Uasin Gishu	209	175,799	285	37,655	18,372	17,635	780	—	250,526
Trans Nzoia	108	115,456	280	13,890	13,108	7,314	20	1,261	151,330
Nakuru	73	73,632	5,675	3,825	14,081	3,105	2,240	1,050	103,608
Naivasha	54	51,613	2,250	9,133	9,625	9,308	3,003	173	85,105
Laikipia	37	29,320	105	4,845	22,063	4,829	5,696	3,082	69,940
Lumbwa	20	21,907	125	5,510	1,465	2,390	—	2,000	33,397
Sotik	17	20,447	250	1,600	3,670	750	210	—	26,927
Nyeri	8	5,715	474	600	900	4,000	1,270	500	13,459
Machakos	3	4,240	—	400	225	—	—	—	4,865
Nairobi	7	5,200	300	—	4,704	120	1,384	—	11,708
Thika	1	—	—	—	—	—	—	7,200	7,200
Total	537	503,329	9,744	77,458	88,213	49,451	14,603	15,266	758,064

Seed Certification.—The Seeds Officer, Nakuru, received 103 applications for the certification of seed wheat, 23 for seed barley and three for oats. The area inspected was 4,410 acres of which 2,592 acres were passed. The number of bags of cereal seed that were sealed and certified during the year was 7,274. In the seed-cleaning plant at Nakuru were cleaned 235 bags of wheat, 326 bags of barley, two bags of rye, 1,325 lb. pyrethrum, eight bags of Cocksfoot grass and half a bag of white clover.

ASIAN AREAS

In the Nyanza Province the area farmed by Indians is devoted mainly to the growing of sugar cane which is sold to the Miwani Sugar Mills Limited, who are the largest producers in the area. Some of the cane is used for making jaggery on the individual farms but a larger proportion than normal was sold to Miwani during the year and the amount of jaggery produced was less than usual. Small quantities of maize, rice and chillies were also produced by Indian farmers, the latter being exported to the extent of 3½ tons. Progress in the improvement of farming in these areas included the extended planting of higher-yielding sugar canes and the improvement of communications and processing facilities.

Asian-owned plantations in the Coast Province produce coconuts, sugar, kapok, sisal, mangoes and pawpaws. During the year the coconut plantations were improved by the removal and replacement of senile and worthless palms and the clearing away of useless scrub undergrowth. One of the most important sources of vegetable production in the Coast Province is from the intensively irrigated areas in the Coastal Strip. These are farmed by Indians, water being obtained from irrigation wells and manure from the Makupa dairies and the Hinterland.

AFRICAN AREAS

General.—Within the framework of existing services augmented by staff and funds provided under the Swynnerton Plan good progress was made during the year in developing the African farmer and increasing his potential production.

Nyanza Province.—There has been a slight increase in the percentage of land under sound systems of farming during the year more especially in Central Nyanza where the area under well-managed cash crops such as rice has greatly increased. In Kericho District the enclosure of holdings continues apace particularly in the more backward areas, such as Sotik division. Enclosure is also taking place in the Kisii Highlands and as far afield as the Butende country in the south near the Tanganyika border.

The scheme for "Rewards for Good Husbandry" was continued during the year financed from district Agricultural Betterment Funds. All rewards were given in kind and were often directed towards the improvement of animal husbandry. In North Nyanza where this scheme was most in evidence the number of Maize Bonus awards to individual farmers was reduced from 990 to 220. This reduction was due to failure of many farmers to raise the standard of their manuring, rotation and conservation works. It is intended in future in North Nyanza to confine awards to those farmers who have had their farms planned and implement the plan satisfactorily. In other districts also the number of awards for merit was reduced in an effort to raise the general standard of farming. The issue of loans to approved farmers for the improvement of their holdings was to some extent restricted during the year because of the large number of defaulters particularly in North Nyanza and South Nyanza. To qualify for a loan farmers now require the recommendations of an officer of the Department of Agriculture and the blessing of the Locational Council. In Kericho District loans are, to a large extent, taking the place of rewards for good husbandry.

The planning of African farms in North Nyanza has met with great enthusiasm. By the end of the year 110 farms had been surveyed and of these farms a total of 4,025 acres had been planned. Many of these farms are large and the greatest demand is in the Kitosh areas of Northern Division and also in Western Division. In the Southern Division it has been difficult to find farmers with consolidated holdings of economic size because the land is held in fragments. In other districts progress has been less spectacular.

In the Province as a whole it has, so far, proved extremely difficult to get pastures cleared by any communal means. Much of the grassland is still heavily infested with useless bush and weeds. Wherever grassland is enclosed the effect is immediate and striking. In the celebrated Buret Division of Kericho there has been a marked deterioration in the maintenance of enclosed pastures.

The introduction of fertilizers made some progress during the year in North Nyanza where ten tons of single superphosphate were bought by farmers in 25-lb. paper bags for application to their maize lands. The need for the application of these fertilizers had been shown by a number of years of fertilizer trials by E.A.A.F.R.O. and the Agricultural Department. Interest was mainly confined to the Kimilili area of North Nyanza. The high price of this fertilizer in small packets to the grower may, however, prove to be a deterrent to rapid expansion of its use.

Rift Valley Province.—Progress in improved farming in the form of a very marked move towards enclosure of individual holdings took place in Nandi, Elgeyo and South Baringo. Stimulation of better farming has been pursued through various means. There has been a general encouragement in the making and application of farmyard manure, cultivation on the contour and rotation of reverted grasslands. Demonstration holdings have been created to teach farmers how to run their enclosures. A survey has been made of 3,000 acres in Nandi and 300 acres in West Suk and 300 acres in Elgeyo as a basis for skeletal planning for district conservation work and farm planning. In the Nandi area the conservation works

have been completed and form the framework in which to fit the individual planned farms. Loans have been made to prospective good farmers to expedite the proper development of their holdings by employing labour and Young Farmers' Clubs have been formed in Nandi and Elgeyo to spread and increase knowledge of good farming practices.

In the semi-arid areas every effort is being made to carry out grazing control and specific schemes have been started in West Suk, Baringo and Samburu. Outside these schemes severe destocking will be required before progress can be made.

Central Province.—In general much has been done towards improved farming both by communal labour and repatriate gangs. The situation is still dominated by the Emergency and progress has taken the form of mechanical work on the ground rather than the inculcation of sound methods into the minds of individual farmers. Many miles of bench terracing have been built, thereby at least arresting further erosion on hillsides. Thousands of acres have been cleared of bush and scrub wattle, planted to grass and fenced. Owing to the Emergency the population in some districts has had to be concentrated into large villages for security reasons. This has led to a drop in the number of cattle sheds built on farms but they have been erected in villages and manure made in bulk. To overcome the problem of transporting this manure to the individual holding in Embu District contractors have been supplied with donkey carts through the medium of Agricultural Betterment Fund Loans and are contracting to transport the manure. The chance is not being lost of mass education of the population in the preparation and use of farmyard manure. Details of the improvements effected in the districts will be found in Table F.

Owing to the necessity to villagize the population the farming of individual smallholdings has deteriorated particularly in Nyeri District. This is not surprising since neither the farmer nor his stock are any longer resident on the farm. Added to this is the fact that the farmer himself is usually an active Home Guard, thus reducing his working hours on his own land. In the Nyeri District consolidation of holdings within the "Mbari" lands made encouraging progress and by the end of the year 14 African Surveyors were working on this. Some progress was recorded in Fort Hall District in consolidation of holdings where three pilot schemes have been initiated.

Southern Province.—In the more progressive areas of the Southern Province the adoption of improved methods of farming is spreading rapidly. The resultant improvement in the wealth of the individuals concerned is tending to attract men back on to the land. A general improvement in the morale of the people in Machakos District has been observed and the markets are busy with trade. The cattleshed is now becoming commonplace, row-planting of crops with placement manuring is becoming popular and bench terracing and paddocking are being widely adopted. Cash crops such as sisal and horticultural crops are bringing in more money to producers and coffee is being planted in the hills. Some farmers are now building superior cattlesheds with brick pillars and metal roofs. Crop failures due to drought occur periodically in the Province and the keeping of large numbers of stock as a reserve of food has long been an Akamba custom. The consequence of this custom has been widespread over-stocking and severe denudation of the countryside. The problem is being tackled by closure and reclamation, grazing control, clearing of relief grazing areas and the encouragement of stall feeding of stock on crop residues to spare the grassland in the hot, dry seasons. The area protected by bench terraces in the Province in 1954 amounted to 1,422 acres and over 11,000 acres were protected by ordinary terraces. Over 26,000 acres of grass were planted of which 15,000 acres were in the Kitui

District. In Kitui District generally good progress has been made in grazing control where over 19,300 acres of bush have been cleared for grazing, nearly 28,000 acres of eroded pasture closed for restoration and 9,000 acres of paddocks fenced with thorn or sisal. The aim is a six-camp rotation for each sub-location in the district with stock limited to the carrying capacity of the various areas.

Coast Province.—The use of manure is increasing in the areas near to the cattle country but its use is limited in the main arable areas because of the presence of tsetse fly. Kilifi and Kwale laid down some 20 minor demonstration plots contrasting maize crops grown with and without manure. The effects in the early rains were striking and attracted considerable attention. Great strides were made in cleaning up undergrowth in coconut plantations and establishing nurseries of selected seedlings for infilling and replacements. In the Teita Hills 95 per cent of the cultivated land has been protected from soil wash by trash lines.

Reconditioning, Resettlement and Development Schemes

The progress of schemes with which agricultural officers were particularly concerned is described below. These schemes are financed from various sources including the Agricultural Betterment Funds of African District Councils, African Land Development Board (ALDEV) funds, the Nyanza and Coast Province Cotton Sales Funds and Swynnerton Plan funds derived from the grant of £5,000,000 generously provided by Her Majesty's Government in the United Kingdom. Responsibility for the integration of existing schemes rests upon provincial and district teams on which officers of the Department of Agriculture serve.

NYANZA PROVINCE

Lambwe Valley.—This is a tsetse fly-infested valley in South Nyanza which is slowly being cleared and settled by Africans from the densely populated locations of South Nyanza such as Karachuonyo and Mohoru. Only 47 new settlers took up plots during the year bringing the total registered to 365. The survey of boundaries was completed and the rules published under Government Notice. The existing Samunye settled area is not yet free of tsetse fly and has not yet been opened to cattle. This and tighter control is thought to account for the slow rate of settlement.

Kimulor Scheme.—The aim of this scheme is the development of 7,450 acres of unused land in Kericho District. The allocation of farms is now complete and considerable development has taken place on the earlier allocated plots. In the Tebengwet part of the scheme, where the indigenous forest cover was very heavy, half the farms still have over 50 per cent forest. Early in the year, some of the people allocated farms refused to take them up rather than receive an occupation certificate: the farms were accordingly re-allocated to others.

Chepalungu Scheme.—This provides for the clearing and settlement of a mile-wide border strip in order to prevent the entry of tsetse fly into Kericho District from breeding grounds in Masai country. In conjunction with the authorities in Masai the Kipsigis have cleared large areas of land in Masai and have cultivated them which has made the fly barrier very much more effective but it has not been agreed that they may settle these areas permanently. This scheme ends as such in June, 1955.

Itembe Scheme.—This area of two farms on the edge of the Sotik settled area at Sotik Post has been surveyed with a view to settlement. The vlei soils which comprise much of the area have not yet been proved capable of economic crop production and settlement is being delayed pending the results of crop experimentation and drainage on the experimental farms.

Samia Scheme.—The large-scale fly-clearing scheme in Samia has not progressed very satisfactorily. None of the dams constructed by the Dam Construction Unit have yet filled up and possibly as a result of this settlers did not take up plots allocated to them.

CENTRAL PROVINCE

Kikuyu Relief Works.—Many of the large number of Kikuyu repatriated from the Highlands and from Nairobi were provided with paid relief works to tide them over the period of settling down and getting land under cultivation. For this £195,000 was made available in the financial year 1954–55 under the Swynnerton Plan and they undertook in the Nyeri, Fort Hall and Kiambu Districts the works described for the Central Province under Soil Conservation and summarized in Table F.

SOUTHERN PROVINCE

Machakos District Reconditioning Scheme.—This scheme which covers general rehabilitation measures throughout the Machakos Reserve has made good progress during 1954. During the four years since the scheme came into operation the face of the District has materially changed for the better and the dismal prospect of miles of red earth has given place to an appreciable grass cover which is improving under the rapidly spreading grazing control system. The mechanical unit terraced 4,000 acres in the district during the year. The Machakos African Sisal Scheme made good progress and the first 55 acres of coffee on a commercial scale was planted out in the short rains and a new nursery was opened up at Mboni.

Makueni Settlement Scheme.—The target of 1,000 settlers by the end of the year was actually reached in the middle of the year. There has been good progress in improved farming during the year and harvests were good. The dams have recharged well in the short rains and two boreholes have been harnessed. Bush regeneration in the grazing areas of the holdings remains a serious problem although controlled burning had some effect in checking regrowth. Further settlement is taking place in the south of Kibauni Location where conditions are more favourable than further to the south and east.

Kamba Grazing Areas.—The schemes on the Yatta Plateau and at Simba-Emali involve the clearing of tsetse infested bush, the provision of water supplies and the subsequent utilization of these large areas for controlled grazing until payment of grazing fees to relieve the overstocking in the Machakos District. The Yatta furrow, designed to extend the scope of present grazing, only half-used for lack of water, made good progress. The canal is now near the plain above the valley about five miles from the intake. L.R. 7048 comprising 16,000 acres of unalienated land in the European areas of Thika District was granted to the Machakos Akamba in 1954. It had been an embarrassing “no-man’s-land” for many years. It is to be developed as a ranching settlement for about 200 families from the reserve. In the Simba-Emali area there are now 5,869 cattle and 1,745 calves owned by 232 people from the reserve.

COAST PROVINCE

Gede Settlement Scheme.—The total number of settlers is now 378, there being three new settlers during the year. Effort was concentrated in the establishment of tree crops in homestead plots. 4,000 coconut seedlings raised at Gede were planted and the settlers themselves were estimated to have planted another 1,000 seedlings on their own account. In the extension area to the settlement 60 18-acre holdings were demarcated and allocated to new settlers.

Shimba Hills.—Fifty Akamba families started to settle at Shimba this year. The development of the holdings has proceeded satisfactorily and several settlers have established their first windbreaks interplanted to annual crops. It is aimed to settle 750 surplus Wakamba families on a rent-paying basis in this area eventually, but expansion in the early stages will be slow because of the difficult farming conditions.

Coast Hinterland Scheme.—This scheme aims to open up the hinterland of the Kwale and Kilifi Districts at present sparsely populated because of lack of water and the presence of tsetse fly. Emphasis in this area will be on controlled stocking rather than on cultivation settlement. During the year 81 miles of road were constructed and six dams were built. Of over 30 main dams in the area only six held water at the end of the year owing to lack of rain in the hinterland to fill them. The scheme is financed and staffed by ALDEV.

RIFT VALLEY PROVINCE

Riwa Grazing Scheme.—This comprises an area of 25,000 acres in the West Suk District which has been divided into four large blocks roughly equal in size to be grazed communally by the local tribe in rotation.

Esageri-Kisokon Ranching Area.—This is an area of some 26,000 acres in South Baringo which has been split into roughly four equal blocks. Water is available in each block. The total head of cattle has been limited to 2,600 and they will be grazed on a rotational system with four months in each block.

Soil and Water Conservation

SOIL CONSERVATION ENGINEERS' HEADQUARTERS

A great variety of advisory work engaged the attention of the Senior Soil Conservation Engineer during the year. This was apart from his routine duties of supervising the Engineer's Section of the Soil Conservation Service, the operation of the three Government-owned heavy dam construction units and the two "Agron" repair workshops. In the Nyanza Province his work included the inspection of dams and irrigation areas, the Nyakatch reconditioning scheme, the Itembe settlement, drainage trials at Sotik Post, advice on farm layouts in the Kitosh area and the drainage of potential sugar land in Kisii. In the Coast Province recommendations on survey and setting out of farms at Shimba Hills were made and on soil conservation measures in Kilifi and Kwale Districts. In the Central Province advice was given on soil conservation in coffee and sisal, sites of dams and farm planning in the Karatina area of Nyeri District. Farm planning surveys in the Southern Province also received the attention of the Senior Soil Conservation Engineer. In the European areas of the Rift Valley Province his work included visits to farms in the Thomson's Falls, Kinangop, Kitale and Eldoret areas to advise on soil conservation problems, inspect dams and sites of new dams. The European areas of Nyanza Province also received attention in regard to soil conservation work. Advice was given to the Railway engineers, P.W.D. road engineers and County Councils on erosion and drainage problems. Much attention was given to drainage problems in both European and African areas.

Buildings.—The new headquarters of the Soil Conservation Engineers is now well established at Nakuru with European and African staff quarters, offices and workshops all accommodated on the one site. During the year extension was made to the stores at the Nakuru Agron workshops and a new shed completed to house the carpenter's shop, paint shop and blacksmith's shop. An additional store has also been completed at the Kitale Agron workshops. The P.W.D. have commenced the building of six new European staff quarters at the Nakuru headquarters and two African staff quarters have been completed. The construction of eight African staff quarters at Kitale by the P.W.D. has also commenced.

Workshops.—The “Agron” workshops continued to be responsible for the full maintenance and repair of all tractors, machinery and vehicles operated by the Soil Conservation Service and of departmental vehicles and farm equipment in their vicinity. In the Nakuru workshops 433 jobs were completed including 113 major overhauls and the building of two caravans. In the Kitale workshop 328 jobs were completed of which 23 were major overhauls and two trailers were built. In addition at this workshop one seed scarifier, one pump outfit, one clover seed harvester and two stationary engines were built up.

Levellers' School.—Fifty African staff were instructed in various forms of survey and refresher courses for work in the Soil Conservation Service. A trade test was held in September, the results of which were not of a high standard, and only four passed.

Aerial Survey.—Aerial survey has been taken over by and centralized under the Director of Surveys serving all departments of Government. Close co-operation with the Department of Surveys was maintained during the year by the Senior Soil Conservation Engineer and by Provincial Agricultural Officers in connexion with surveys for farm planning and for reconditioning, settlement and irrigation projects in African areas under the Swynnerton Plan.

SOIL CONSERVATION—EUROPEAN AREAS

Terracing.—The area of farmlands protected against erosion in 1954 was 27,518 acres compared with 27,722 acres in 1953. The total area of farmland protected against erosion by the department's mechanical units has now reached 184,733 acres. In 1954 while a large increase in terracing was achieved in the Uasin Gishu District, there were small declines in the other districts for the reasons stated below. The actual hours worked by the tractors is lower than last year and out of a total possible operating time of 73,016 hours, 40,900 hours were lost due to breakdowns, difficulty of obtaining spares and adverse weather conditions. The adverse weather held up work and caused a late start to the season in the Rift Valley Province where most of the work is undertaken and five out of the seven mechanical terracing units are in operation. Units at Thomson's Falls and South Kinangop spent a proportion of the year on Emergency work mainly the building and regrading of roads. The effect of the Emergency was also felt in the shortage of levellers and of labour on farms and a general slowing down of development on some farms. Comparative figures of work done are set out below, and details for 1954 are given in Table E.

ACREAGES PROTECTED BY SOIL CONSERVATION MEASURES

DISTRICT	1941-51	1952	1953	1954	Total
Trans Nzoia	27,774	6,455	5,924	5,213	45,366
Uasin Gishu	20,900	5,366	4,240	8,937	39,443
Nakuru	36,974	5,624	4,819	4,727	52,144
Thomson's Falls ..	8,999	8,246	10,493	(a) 3,862	31,600
South Kinangop ..	—	—	—	(a) 3,772	3,772
Nyanza	5,094	1,080	1,355	866	8,395
Nairobi	2,563	418	891	141	4,013
TOTAL ..	102,304	27,189	27,772	27,518	184,733

(a) A separate unit is now operating in South Kinangop.

Permanent Crops.—In the Nyanza and Nairobi areas much of the land is occupied by permanent crops such as tea and wattle in Nyanza and coffee, sisal and pineapples in the Nairobi District. Nearly 1,000 acres of sisal were planted on the contour in the Nairobi District. The need for contour planting and on steep slopes for additional protection in the form of diversion ditches and terraces is now being recognized by the more progressive planters. The acreage of permanent crops known to be protected by suitable soil conservation measures is shown below:—

SOIL CONSERVATION IN PERMANENT CROPS (ACRES)

CROP	1941-51	1952	1953	1954	Total
Sisal	3,826	571	198	1,416	6,731
Wattle	4,173	157	226	—	4,556
Tea	2,989	560	496	275	4,320
Coffee	851	109	88	140	1,188
New Zealand Flax ..	649	350	—	—	999
Total Acres ..	10,163	1,747	2,728	1,831	17,794

Farm Planning.—The Assistant Soil Conservation Officers make the surveys and the boundary and contour maps which form the basis upon which the layout and farming programme is planned. Thereafter the programme of development is worked out by the farmer and agricultural officer and followed up by frequent visits and advice from the latter. There is still a heavy demand for farm planning and in the Uasin Gishu District alone there is a waiting list of some 38 farms. Shortage of suitable staff led to a drop in the number of farms planned in 1954. However, funds made available to implement the Troup Report, which laid great emphasis on this aspect of the department's work, will correct this once new staff has gained the requisite experience of local conditions. Details of the work accomplished in this direction in 1954 are given below:—

FARM PLANNING, 1954

DISTRICT	Farms Surveyed and Mapped		Farms Planned	
	No.	Acres	No.	Acres
Nakuru	8	9,600	7	6,000
Uasin Gishu	4	6,991	3	3,700
Trans Nzoia	1	956	2	4,244
Thomson's Falls	2	3,000	2	3,000
Nyanza	—	—	—	—
Nairobi	1	490	1	276
TOTAL	16	21,037	15	17,219

TABLE E—SOIL CONSERVATION SERVICE—EUROPEAN AREAS—OUTPUT OF TERRACING FOR YEAR 1954

DISTRICT	No. of Farms treated by Tractor	ACREAGE PROTECTED BY					COMPLEMENTARY WORKS					
		Broad Base & V Terraces	Diversion Ditches (a)	Narrow Base Terraces	Bench Terraces	Total	Roads	Excavation (b)	Training Banks	Outlet Drains	Cut-off Drains	Small Dams
Trans Nzoia ..	31	2,618	2,595	—	—	5,213	<i>Yards</i> 94,319	<i>Cubic ft.</i> 142,839	<i>Yards</i> 9,995	<i>Yards</i> —	<i>Yards</i> 112,146	<i>Cubic yd.</i> 1,500
Uasin Gishu ..	49	6,490	2,447	—	—	8,937	50,142	—	2,232	8,063	19,209	35,194
Nakuru ..	54	3,602	1,125	—	—	4,727	51,118	—	53,906	1,260	51,610	36,221
Thomson's Falls ..	26	393	3,469	—	—	3,862	101,688	64,440	1,380	2,112	8,573	5,570
South Kinangop ..	34	—	3,772	—	8	3,780	117,000	—	14,900	—	76,049	7,000
Lumbwa ..	22	324	542	—	—	866	31,826	50,912	—	3,245	16,361	14,467
Nairobi ..	8	141	—	90	9	141	5,543	68,500	1,233	1,139	5,217	20,040
	224	13,568	13,950	90	17	27,526	451,636	326,691	83,646	15,819	289,165	119,992

(a) Acreage protected by diversion ditches as sole protection.

(b) Completion of terracing—removal of high and low spots by labour and machinery.

Dam Construction.—The seven soil conservation units have made a number of small dams during the year. This work is normally carried out in periods when, due to rain or growing crops, little terracing work can be done. The Lumbwa unit completed 11 dams in the Sotik area and the Nakuru unit built ten small dams. The total number of farm dams built by all the soil conservation units during the year totalled 33. Further details of this work are given in tabular form in a subsequent section of this report under the heading "Water Conservation—Mechanical Dam Construction Units".

Soil Conservation Finance.—Government continued to meet the full cost of the Engineer's headquarters, the advisory staff in African areas and the advisory services in European areas. Of the annual cost of the operational services in European areas half was met by Government and half was recoverable by charges to farmers. Charges to farmers for soil conservation work were increased on 1st September, 1954, and all items on the tariff except hire charges and charges for farm planning surveys were slightly raised to meet rises in salaries and costs.

Charges invoiced to farmers on 450 accounts in 1954 totalled £53,804 compared with 400 accounts totalling £55,480 in 1953. Work on the recovery of debts continued and of £51,180 outstanding at the end of the year, £20,181 was in respect of work done for farmers in the years 1947–53.

Land and Water Preservation Ordinance.—The Director of Agriculture issued 42 Orders under the Land and Water Preservation Rules in 1954. Of these Orders 29 required the protection of land by terraces, two provided for the closure of river banks and ten required the closure of eroded land while one related to destocking.

The Assistant Soil Conservation Officer/Inspectors in each European district continued the inspection of farms, drawing the attention of farmers to erosion on their land, infringements of the rules and advising them on the correct methods of maintaining terrace layouts and ploughing. They also supervised the river scouts. In the Thomson's Falls area river scouts had to be withdrawn for Emergency reasons. The necessity to kraal cattle at night in areas affected by the Emergency is causing some erosion near homesteads. In the Uasin Gishu the Inspector reports good progress with farmers making their own terraces. River scouts based on the Soil Conservation Centre at Ruiru have been of great assistance to sisal estates by laying out master contours for the planting of sisal on the contour. At Kitale river scouts did good work during the year and river banks are in excellent condition. In the Uasin Gishu District the number of river scouts was reduced to three but 882 acres of "squatter shambas" were marked out for grass strips. 2,273 acres of "squatter shambas" were similarly protected in Nairobi District.

SOIL CONSERVATION—AFRICAN AREAS

Nyanza Province.—In general throughout South Nyanza and Kericho Districts soil conservation measures, most commonly the grass filter strip, are about 90 per cent effective and there is little erosion of soil in cultivated land. In parts of North Nyanza also, soil conservation measures are effective but in the Southern Division of North Nyanza and in the whole of Central Nyanza the position is not so satisfactory. The areas occupied by the Luo tribe are particularly bad and grass strips are constantly destroyed by uncontrolled stock. It has been found necessary here to appoint soil conservation inspectors with powers to prosecute in each location. This has resulted in some improvement in the maintenance of grass strips but the overall picture is one of steady deterioration of both pasture and arable land. In North Nyanza 7,570 miles of grass filter strips were marked out during the year and in addition 180 miles of narrow-based terraces and 193

miles of bench terraces were constructed. The bench terraces have been largely made for the planting of coffee on the slopes of Mount Elgon. In Central Nyanza 1,850 miles of grass filter strips were marked out during the year and 540 miles of bench terraces constructed. Kikuyu prisoners were employed during the year on the Nyakach escarpment in the making of stone walls at narrow intervals on the contour. More recently they have been employed in making large planned stone walls enclosing paddocks of varying size on the contour to allow grass to regenerate and provide controlled grazing for cattle. To quote from the Assistant Director of Agriculture's Report, Nyanza Province: "The result has been an immediate increase in grass cover which will, in a year or two, cause a striking difference in the amount of run-off from these hills. This sort of work could not be done economically by any other means and it seems likely that it will remain to cause astonishment and speculation among archæologists hundreds of years hence."

Rift Valley Province.—Leaving out of account the semi-arid areas and small portions of the steep cultivation on the edge of the Rift Valley there is little or no erosion as a result of cultivation, all crop land being effectively protected by grass strips or terraces. The grazing lands, however, both in the high rainfall and semi-arid areas are still in a most unsatisfactory condition. Here the picture is one of over-stocking and over-grazing leading to severe denudation and strong action is called for by Government to avoid the creation of permanent desert conditions.

Terracing has been given more attention during the year, particularly in Baringo District where large areas have been protected. In the Ndalat area of Nandi District some 600 acres have been protected by the construction of cut-off drains, 400 acres being constructed by machinery of the Soil Conservation Service. Other conservation measures in the African areas of the Rift Valley Province included a successful tree-planting programme in Elgeyo and Nandi and the establishment of nurseries at Kapenguria, the starting of grazing control schemes in West Suk (Riwa) and South Baringo (Esageri) and the bulking of grasses for distribution on African District Council plots.

Central Province.—The Central Province continued to be the area worst affected by the Emergency conditions that prevailed throughout the year. In spite of this, however, satisfactory progress was made in the Province as a whole, much work being done by communal labour gangs and on paid relief works. There was a large increase in the amount of bench-terracing constructed in the Kikuyu districts where labour forces of repatriates were available in addition to communal labour. In Kiambu District whole valley features have been redeveloped, the steeper cultivations being bench-terraced and slopes over 35 per cent being fenced into paddocks and started to grass. The areas bench-terraced, particularly old wattle lands, have first been de-couched, a task requiring an enormous amount of labour.

Apart from vast areas of bush clearing carried out for security reasons connected with the Emergency, much really constructive work was done in the Province in the clearing of slopes and the removal of bush, scrub, wattle and bracken. Subsequently these areas were fenced and cattle kept out to encourage a good grass cover. Where necessary grass was hand-planted particularly in Kiambu District, though this was not needed in Embu District.

Some tree planting was carried out during the year particularly in Embu District where 160,000 trees were planted. With regard to grazing control a certain amount of compulsory closure has been effected by the creation of prohibited areas. There has been no fall off in the desire to use manure but it was necessary

to adapt the preparation of it to suit existing conditions. Where people are still living on their holdings cattlesheds are being built on the holding. Where villagization has taken place, however, sheds were erected by the villages and a manure-making campaign was inaugurated. The result has been that more manure than ever before is going on to the land. Details of the soil conservation work done in the Central Province in 1954 are given in the accompanying Table F.

Southern Province.—There was a reduction in the availability of communal labour for soil conservation work in Machakos District owing to increasing demands in other directions as a result of the Emergency. In spite of this, however, 3,776 miles of narrow-base terraces were constructed during the year and 711 miles of bench terraces. In Kitui District terracing is not employed to the same extent as in Machakos. Gradients are easier and although denudation of grass cover has been widespread, erosion has been less severe. It has been found that closure of the land combined with "scratch" ploughing on the contour and seeding to grass achieves a rapid and satisfactory result. Nearly 28,000 acres were treated in this way in Kitui District in 1954.

The mechanical terracing unit protected 4,000 acres in Machakos District, work which included the provision of access roads, drainage ways and cut-off drains. Machines from this unit also constructed four large dams during the year in the Tulimani area as well as six small dams designed for the protection of drainage lines. Grazing areas in Kitui District were extended by the clearing of 30 square miles of bush with communal labour. Progress was also recorded in the use of manure. In Machakos District over 1,000 roofed cattlesheds were constructed and in Kitui District 50. A good start was made with the reafforestation of the denuded hill masses of Machakos by the planting-up of 250 acres during the short rains. A total of 20,000 acres of hilltops have now been set aside as African District Council Forest Reserves.

The overall picture in both Machakos and Kitui Districts is one of remarkable improvement in the appearance of the countryside. Extensive areas which only four years ago were completely denuded and exposed are now appreciably grass-covered. The flow of streams has improved particularly in the dry periods. River valleys have been stabilized by the planting of Napier grass. On all sides bush-clearing and paddocking can be seen. Details of the soil conservation work done in the Southern Province in 1954 are given in the accompanying Table F.

Coast Province.—The construction of trash lines continued in all districts but the lack of crop stovers and weeds brought about by exceptionally dry conditions in most areas caused a large discrepancy between miles contoured and miles of trash lines laid. In the Province as a whole 3,189 miles were contoured and trash lines to the extent of 2,610 miles were laid. The total acreage so protected during the year amounted to 9,537 acres. In addition in the Voi District 320 miles of live wash-stops were planted. In Kilifi District 187 holdings on very steep slopes were closed to cultivation and 293 further holdings were partially closed. In the foothills of the Teita Hills gully stopping was continued and 1,369 gulleys were protected by the construction of 4,887 gully stops. In Teita also extensive tree planting was carried out during May and June whenever showers permitted, 150 acres of eroded land being planted at Ronge Juu and 21,490 seedlings issued to individuals and schools.

WATER CONSERVATION—MECHANICAL DAM CONSTRUCTION UNITS

The Engineer's Section of the Soil Conservation Service remained responsible during the year for the work of the units engaged in the building of dams. These consisted of three Government-owned heavy Dam Construction Units and seven district Soil Conservation Units which are equipped with dam-building machinery.

TABLE F.—SOIL CONSERVATION FOR 1954—CENTRAL PROVINCE AND SOUTHERN PROVINCE

DISTRICT		Narrow Base Terracing	Bench Terracing	Wash Stops	Areas Closed or Recon- ditioned	Bush or Bracken Clearing	Grass Planted	Cattle Sheds Built	Compost Pits in use
		<i>Acres</i>	<i>Acres</i>	<i>Miles</i>	<i>Acres</i>	<i>Acres</i>	<i>Acres</i>	<i>Number</i>	<i>Number</i>
CENTRAL PROVINCE:—									
Meru	..	33	114	44	1,222	5,584	1,211	147	2,541
Embu	..	4,671	273	814	1,279	5,534	2,722	1,078	2,108
Nyeri	..	3,790	2,468	583	—	5,094	1,287	18,234	1,677
Fort Hall	..	9,333	3,342	1,482	29,481	81,828	5,233	5,999	18,483
Kiambu	..	8,460	2,054	218	1,504	14,103	1,927	4,981	26,284
SOUTHERN PROVINCE:—									
Machakos	..	11,078	1,422	—	—	—	11,246	(a)	(a)
Kitui	..	—	—	375	27,956	19,322	15,325	(a)	(a)
1954	..	37,365	9,673	3,516	61,442	131,465	38,951	30,439	51,093
1953	..	54,986	16,821	7,717	54,657	78,938	19,525	12,937	37,773
1952	..	71,487	4,375	5,387	41,535	42,603	32,307	28,959	36,792

(a) Figures not known.

Of the three heavy Dam Construction Units Nos. 1 and 2 were established from funds originally provided by the Development and Reconstruction Authority. The No. 3 Unit was financed by the Nyanza cotton Sales Fund for construction work in Nyanza Province. The programme of work for these three heavy units is subject to approval well in advance by the Colony Water Resources Authority but the work carried out is the responsibility of the Engineer's Section.

Since the inception of the scheme the three heavy units have built 308 dams and large waterholes providing storage for 4,269,000,000 gallons of flood water at a cost of £267,033. In spite of delays caused by the need to re-equip Nos. 1 and 2 heavy units a total of 58 dams were completed by all units. The water storage capacity created by the year's work amounted to 842,000,000 gallons compared with 950,000,000 gallons in 1953. The number of farm dams built by the Soil Conservation Units was 33. Details of the work done are given in the following table:—

DAM CONSTRUCTION—1954

UNIT	No. of Dams	Earth Moved	Water Storage	Cost per Cubic Yd.	Tractor Hours Worked	Mean Output per Tractor hr.
		<i>Cubic Yd.</i>	<i>Mill. gal.</i>	<i>Sh.</i>		<i>Cubic Yd.</i>
HEAVY UNITS:—						
No. 1 D.C.U.	11	158,679	178.59	2.24	3,316	47.8
No. 2 D.C.U.	3	54,438	70.9	2.13	1,346	40.4
No. 3 (Nyanza) D.C.U.	11	204,632	530.8	2.09	3,845	53.2
S.C.S. UNITS:—						
Eldoret	5	35,194	—	—	641	54.9
Thomson's Falls ..	2	5,570	—	—	158	35.2
Kitale	2	1,500	0.8	—	74	20.3
Nakuru	10	36,221	29.6	—	1,228	29.5
Ruiru	2	20,040	15.0	1.16	434	46.1
Lumbwa	11	14,467	16.4	2.20	627	29.0
South Kinangop ..	1	7,000	—	—	121	57.8
TOTAL	58	537,741	842.09	—	11,790	41.42

Note.—The above figures do not include the large number of dams built by the African Land Development Board, African District Council Units and by communal labour. Details of these are given in the subsequent section entitled "Water Supplies, African Areas".

No. 1 Dam Construction Unit was in the Trans Nzoia area at the start of the year where nine dams were completed by the end of May. The Unit was then overhauled and moved to the Ruiru area in September, constructing two large dams by the end of the year each with a capacity of 240 acre feet and costing together approximately £8,900. No. 2 Dam Construction Unit was in South Nyanza at the beginning of the year remaining at work until April on the construction programme financed from the funds at the disposal of the African District Council. Three dams were completed of a capacity totalling 260 acre feet. The Unit was then withdrawn to Kisii Boma for repairs and overhaul as the tractors had exceeded their economic life. It was decided that the tractors should be replaced and by the end of the year money had been made available for this purpose. The European staff had meanwhile been transferred to No. 3 Unit which worked on 11 dams in Central Nyanza during the year with a capacity of 1,950 acre feet and a value of £21,423. The tractors of this Unit were renewed in October, 1953, and various difficulties arose with the new type tractors leading to 43 days' delay on repairs. There were also staff difficulties with this Unit during the year and in August the European staff from No. 2 Unit moved from Kisii and took over.

Dam Construction Finance.—The charge for work by heavy Dam Construction Units was increased in August from Sh. 85 per hour to Sh. 115 per tractor-hour. The accounts rendered for the work of No. 1 Unit during the year amounted to £17,812. The work of the other two units was financed from African District Council moneys and the Nyanza Cotton Sales Fund. Accounts outstanding at the end of 1954 totalled £15,080 of which £10,854 was in respect of dams constructed in the years 1948–1953 inclusive.

WATER SUPPLIES—AFRICAN AREAS

Nyanza Province.—A total of 14 large dams were built in the Nyanza Province in 1954 by the Mechanical Dam Construction Units. Three of these dams were built in South Nyanza where, since the mechanical dam building programme began, 34 dams and five waterholes have been constructed. All these dams in South Nyanza are protected with stock-proof fences and live hedges and six of them have been stocked with *Tilapia* sp. Four dams situated near the Tanganyika border on volcanic soil failed to hold water. Apparently the bottoms are porous and the question of treatment is being investigated. In North Nyanza and Kericho Districts no new dams were constructed but the forty dams in Kericho are being maintained in a new way. Hitherto the responsibility has been that of the African District Council and it has cost them approximately £600 per year. The local people are now being made to take a keener interest in maintenance and the responsibility is now being thrown on the Local Councils. In the Kericho District African farmers are being encouraged by means of loans to develop their own individual water supplies in the form of shallow wells and roof catchment with the necessary storage tanks.

DAMS AND LARGE WATERHOLES CONSTRUCTED—NYANZA PROVINCE

		<i>Before 1952</i>	<i>1952</i>	<i>1953</i>	<i>1954</i>	<i>Total</i>
North Nyanza	..	22	10	1	—	33
Central Nyanza	..	28	10	13	11	62
South Nyanza	..	9	20	32	3	64
Kericho	..	104	11	—	—	115
		—	—	—	—	—
Total	..	163	51	46	14	274
		—	—	—	—	—

Rift Valley Province.—In Baringo District existing waterholes were cleaned out. Considerable encouragement has been given in Nandi District to the development of individual water supplies. Three large dams were built in this district in conjunction with the cut-off drain construction at Ndalat. All three dams are holding water. In addition a small waterhole was constructed at the end of a cut-off drain and successfully retained water. This idea should catch on as it is well within the capacity of the local African farmer to build for himself.

Central Province.—Work in this Province was thoroughly dislocated by the Emergency. The once-popular hand well-drilling rigs now lie idle since the people have been congregated into large villages and interest in the development of individual holdings has declined.

Southern Province.—Communal dam construction work in Machakos concentrated on maintenance during the year. Many of the communally built earth dams required attention, inadequate walls were heightened and spillways brought up to specification. In Kitui District 48 small earth dams were constructed, oxen and dam scoops being widely employed. The mechanical unit of the Machakos Reconditioning Scheme constructed four large earth dams in the Tulimani area and six smaller ones. In addition three sub-surface dams were made on suitable

sites in sand rivers in Machakos District and six in Kitui District. There is also a scheme under the African District Council for the sinking of boreholes at principal markets throughout Machakos District. A local African District Council Water Board will administer them and impose a scale of charges. Three boreholes have been sunk in 1954 near markets, one on the Yatta and one at Makueni. Work on the Yatta furrow continued through the year and besides opening up more grazing land it is expected that it will create considerable scope for the irrigation of crops.

Coast Province.—The very dry year again emphasized the necessity of providing adequate water supplies in the hinterland to anchor the population. It is not unusual for water to be carried 15 miles or 30 miles for the double journey. In the Province as a whole nine new dams were completed and 11 dams were enlarged or repaired. The fencing of dams was continued. A survey of the Makasinyi area was also completed to ascertain whether it will be possible to re-open the area to irrigation.

FIELD DRAINAGE

Observation and trials on field drainage were continued by the Senior Soil Conservation Engineer in the Ol Joro Orok, Kinangop, Sotik, Ruiru and Ol Kalou Districts where there are considerable areas of vleiland susceptible of improvement by drainage. In Sotik where there is much wet land the experiments detailed in last year's report have given indications that, with the application of phosphate and some drainage, quite good arable crops can be grown. A drainage experiment was set out on the Kapturongai Estate on ant hill land characteristic of the area in part of which the ant hills had been levelled off and in other sections had simply been rounded.

Experimental work was carried out at Ol Joro Orok experimental farm during the year with tile drains. The cost of tile drainage here has run out at between £50 and £60 per acre, final figures not yet being available. A trial has also been made with French drains filled with locally available pumice stone. It is still too early to report on this experiment. Experiments with ridge and furrow ploughing proved fairly successful and this appears to be the cheapest method which farmers can employ on wet land. While fairly successful with crops, it has not been so successful at Ol Joro Orok with grasses as there is difficulty in establishing grass leys, particularly in the furrow section.

During 1953 cut-off drains were put in in certain areas of the Kinangop on a $\frac{1}{2}$ per cent grade allowing for ridge and furrow ploughing to be fitted in between the cut-off drains to give a length of furrow of about 600 ft. on a 1 per cent fall. The ridge and furrow ploughing was not carried out and a trial was made on the effect of the cut-off drains alone. In some cases this was fairly satisfactory, but in others, the trial has not given good results. It appears that it will be essential to ridge and furrow plough in between cut-off drains.

On a farm in the Wanjohi Valley at Ol Kalou, shallow drains were cut with a Cuthbertson ditcher 32 in. wide and 8 in. deep with a specially made blade. This work is reported to be very successful in draining grassland and the cost at Sh. 2 per acre compares favourably with Sh. 10 per acre when a terracer was used to make the drains. Trials with a mole drainer at Ruiru in heavy clay soil were not very successful, discharge during the long rains being negligible although the ground surface was under 2 in. of water. It appeared that the heavy clay soil sealed itself over the mole channel.

Drainage work completed during the year amounted to more than 7,200 acres treated by the construction of diversion ditches in the Kinangop and Thomson's Falls areas. A further 542 acres were dealt with in a similar manner in the Lumbwa area and a small acreage in the Ruiru District.

Irrigation

Mr. F. A. Brown, ex-manager, Sudan Gezira Scheme, arrived out in November to advise on irrigation development and management in all the areas under investigation or development.

Nyanza Province.—A detailed survey of the water resources of this Province is being undertaken by Sir Alexander Gibb and Partners to assess the potential and to indicate suitable projects for irrigation and swamp reclamation taking into account the effect of the Owen Falls dam on the level of Lake Victoria.

Rift Valley Province.—The Perkerra Irrigation Scheme was considerably extended during the year. The works camp for displaced Kikuyu at Marigat was engaged during the year on the development of the scheme to irrigate about 4,000 acres of the Njemps Flats from the Perkerra River. The main canal has been completed and work on subsidiary canals is going ahead. By the end of the year 250 acres had been planted and a further 700 acres were being prepared for cropping early in 1955. The Perkerra Irrigation Committee has exercised good control over development. The aim of the scheme is to endeavour to interest the local tribes—the nomadic Kamasia—in permanent agriculture and to anchor and settle a proportion of the tribe, at the same time alleviating the severe overstocking within the reserve.

Central Province.—Works camps for displaced Kikuyu established on the Mwea and Tebere plains to construct irrigation canals from the Thiba and Nyamindi Rivers continued work during the year. An aerial survey of 40,000 acres was flown for the preparation of a contour topographical map for the layout of canals and soil surveys undertaken. The experimental area under rice was increased during the year and an Assistant Agricultural Officer was stationed in the Mwea.

Southern Province.—The Yatta furrow progressed well during the year. A second works camp for displaced Kikuyu is being established at Mwita Siana in order to speed up construction. Five miles of canal had been constructed by the end of the year.

Coast Province.—Soil surveys were conducted in connexion with the scheme to irrigate rice by pumping water from the Tana River on to the Hola plain. Reconnaissance surveys by the Hydraulic Engineer, P.W.D., and Soil Chemist were undertaken of the desert on both banks of the Tana river and of the flood plain in the Garsen reach for further irrigation trials or pilot schemes with a view to preparing a settlement project. Reports indicated that the soil was marginal. The scheme to pump water from the Lumi river at Taveta to irrigate some 140 acres of land has been deferred pending a survey of the whole area with a view to a more comprehensive layout, taking water by gravity from a point much higher up the river.

Agricultural Education

EGERTON AGRICULTURAL COLLEGE

The plans to set up Egerton Agricultural College with its own funds as a self-governing body had not been implemented by the year's end. The intake to Egerton has been very seriously affected by the Emergency.

Eight students completed the final year of the Diploma Course, three of whom successfully passed the examinations and were awarded the diploma. The other five failed in one or two subjects and will re-sit the examinations early in 1955. Ten students completed the first term of the second year of the Diploma Course and five students, one of whom was subsequently called up, commenced the first year of this Course. Two students successfully completed the one-year

Certificate Course in June and six students commenced the course in the new college year starting in September. In September and October two short courses were run one for Dutch farmers which lasted a week and was attended by 16 students, and a Soil Conservation and Survey Course for 27 Assistant Agricultural Officers lasting for five weeks. The demand for Egerton-trained men still remains high and is far greater than the supply.

The College farm had a good year. Roads and fences were realigned adding a number of acres to the cultivable area. The dairy herd was maintained on home-grown feeding-stuffs and good cereal crops were harvested, particularly of maize.

AFRICAN AREAS

Training of Agricultural Instructors.—Three institutions cater for the training of African staff for the department. These are at Matuga, Embu and Siriba (Maseno). The Matuga training centre is staffed and administered by the Agricultural Department and to meet the needs of the Coast Province. The Embu centre caters for the Central and Southern Provinces. The institution at Siriba is a Government Combined Training Centre under the Education Department to which the Agricultural Department seconds staff for the training of agricultural instructors for the Nyanza and Rift Valley Provinces. A two-year course of training for agricultural instructors is provided at all three centres. Particulars of the instructors trained at the three centres in 1954 are given below:—

					<i>Two year Course</i>		
<i>Province</i>					<i>1st Year</i>	<i>2nd Year</i>	<i>Total</i>
Nyanza	..	..	..	..	24	22	46
Central	..	..	..	..	42	17	59
Coast	..	..	..	..	11	17	28
Total entered	..	..	..	..	77	56	133
Failed	..	..	..	..	17	8	25
Total passed	..	..	..	..	60	48	108

The one-year Certificate Course for would-be instructors from backward tribes at the Embu school was discontinued this year.

The land attached to each of the schools has been developed into a series of smallholdings of varying sizes to demonstrate systems of farming adopted to such conditions as may be experienced in the areas where the instructors are likely to work. The surveying and mapping of African holdings for the preparation of a farm plan was taught to 25 agricultural instructors during the year at the small survey school run by the Department at Kisumu. Refresher courses at the Embu centre were restricted during the year owing to the Emergency but a short course was held in Fort Hall District for instructors working on coffee, school gardens and pest control. In Nyanza Province special short courses were arranged for instructors on coffee and animal husbandry and a special course was held for female African instructors.

Farm Institutes.—These institutes cater for the practical training of the African farmer and his family. The Nyanza Province is well provided for in this respect, there being five such institutes in varying stages of development. The Bukura Farm Institute in North Nyanza, the oldest established of the five, gave a one-year course to 20 families in 1954, all of whom came from the North Nyanza District. A number of the holdings at Bukura were replanned and cash crops established on all of them. A number of courses were also held for female instructors, farmers selected for settlement and agricultural staff. The cost of courses given in 1954 was financed by the North Nyanza African District Council.

A number of the holdings at the Siriba Government Training Centre have been planned as a Farm Institute. Unfortunately it was not possible during 1954 to find any families wishing to be trained there. At the Kisii Farm Institute in South Nyanza nine families received training. It is intended to develop two more holdings here, one of which is to be a very intensive holding of $3\frac{1}{2}$ acres. Twenty Boran heifers were purchased for the Institute and seven cows were made available by the Veterinary Department Breeding Centre nearby. Development continued with the new institute at Kabianga to serve the Kericho District where a variety of holdings has been planned from which information will be obtained on different farming systems for the district. To serve the southern part of South Nyanza development of the new Oyani Farm Institute began in the latter part of the year. Ten farms have been planned each with different farming systems making use of the wide variety of soils occurring on the site. The acreages of these holdings vary from five to 37 acres, the smallest being a very intensive farm and the largest a purely pastoral holding on very shallow soil. The holdings are designed to provide subsistence plus an annual income of £100 to the occupier.

School Gardens.—Good progress was made during the year in Nyanza Province with the development of school gardens. In the intermediate schools the aim is to have a smallholding of economic size and in North Nyanza 16 such holdings were planned and laid out. In Kericho District all schools with a minimum of eight acres of land now have a planned holding. In the primary schools the basis of agricultural instruction is a series of 21 comparative plots each illustrating one of the major principles of crop production. The standard of work in these gardens varied according to the interest of the teacher concerned. In South Nyanza the Ranjira School in the Rapogi Division won the District Cup for the best 21-plot school garden.

In all districts of the Rift Valley Province the school gardens have been planned by agricultural staff to show in the simplest form the virtues of rotational farming. The Assistant Agricultural Officer, West Suk, is a member of the working committee of the Rift Valley Rural Secondary School at Kapenguria where the emphasis on practical training is devoted to agriculture.

In the Central Province many schools have moved for protection to Kikuyu Home Guard Posts and have left their established gardens. Very little progress was therefore recorded during the year although towards the end of the year an improvement in the Emergency situation enabled the resumption of instruction, particularly in Meru District.

In the Southern Province the standard of the school gardens is improving and regular visits were made by agricultural staff to give talks and demonstrations. While bench-terracing, rotation of crops and the use of manure has now become general in such gardens, a few more progressive schools have started smallholdings with a herd of cattle loaned by the school elders. The Masai Intermediate School is a good example of this development. In Kitui two schools now have gardens which have been farm-planned and five primary schools have been surveyed for farm planning.

In the Coast Province District schools were visited throughout the year by both European and African staff of the department. In Kilifi District the 21-plot system was introduced into four primary schools.

Young Farmers' Clubs and Better Farming Societies.—In the Central Province enthusiasm varied with the state of the Emergency. About 20 clubs are functioning in Nyeri District and eight in Fort Hall District. Seventeen Young Farmers' Clubs functioned throughout the year in Embu District though progress was hampered by concentration of the population into villages. In the Rift Valley Province one

club in the Elgeyo District functioned successfully throughout the year. The two clubs in the Nandi District formed in 1953 arranged visits during the year to various European farms and to Elgeyo District. In the Uasin Gishu area the five Farmers' Associations for European of all ages continued to do good work and meetings were attended by officers of the department. A number of Farmers' Clubs were formed in the North Nyanza District of the Nyanza Province consisting of groups of individuals who have had their land farm-planned and are keen to go ahead with improved farming. Of these the Yalusi Farmers' Club is the most advanced, consisting as it does of 11 members and 600 acres of land. In the Southern Province the Young Farmers' Club movement has grown steadily during the year and regular visits by these clubs to the various agricultural projects in their districts have been arranged by the District Agricultural Officers. During the year Farmers' Days were held at the principal research stations of the department.

AGRICULTURAL SHOWS

The Royal Show of the Royal Agricultural Society of Kenya was held at Nakuru in October. The department's exhibit depicted the hazards besetting wheat growing, many man-made, and the means of combating them.

In the African areas a very successful show was held at Kitui in March which was attended by H.E. the Governor and a great concourse of local Akamba. A wide variety of local produce was exhibited and some good native cattle. For the first time a show was held in the Butende country of South Nyanza and attracted about 5,000 people some of them from across the border in Tanganyika. Another show was held at Sameta in the Kisii Highlands where a large crowd attended and showed considerable interest in the various demonstrations. The quality of the livestock entries at this show was, however, disappointing. In the Coast Province a successful show was held at Kaloleni in the Kilifi District, several departments co-operating to put on exhibits.

Marketing

PRODUCE MARKETING AND INSPECTION

Responsibility for the inspection and the first stage of the marketing of produce from the African areas remained with the Department of Agriculture during the year. This work was supervised by nine marketing officers which was reduced to eight during the year when the officer at the Coast was withdrawn as an economy measure. These officers are financed from a small cess on each bag of maize and produce handled by the Maize and Produce Control. They supervise a staff of African produce inspectors who are paid by the African District Councils from their Agricultural Betterment Funds to which the revenue from inspection fees is credited. Details of the quantities and value of the produce that passed through the markets in 1954 are given in Table D.

In the Nyanza Province 1954 was a difficult year for marketing staff mainly due to storage problems occasioned by bumper crops. In view of the good food crops throughout the Province a larger proportion than usual of food surpluses was offered to Produce Control, little of it being needed to overcome local shortages. In Kisii District there was a record buying season, 453,933 bags of produce being bought. The 1954/55 buying season in that district opened with only storage for 50,000 bags available; the Kendu Bay stores being partly full of the previous year's crop and the Homa Bay store completely full. In North Nyanza also the maize crop of 710,000 bags was the second highest on record and the sorghum crop of 44,000 bags the best ever. Produce inspection services continued to operate efficiently in the Province during the year.

In the Central Province produce inspection services were maintained in spite of the Emergency. Outstanding improvements were achieved by the marketing officer in Kiambu District in organizing all produce sales including wattle, pine-apples, vegetables and fruit. Particular attention was paid to the training of the African Produce Inspectors in this district and the improvement in their work is reflected in an increase in revenue collected in the field from Sh. 4,316 in 1953 to Sh. 51,044 in 1954 and an all-round improvement in the quality of produce. In the Southern Province the Machakos African District Council has commenced levying an export cess on a wide variety of produce including poultry, eggs, vegetables, fruit, grams, beans and castor seed to augment the Agricultural Betterment Fund. The Kitui African District Council has also made progress in the same direction and is collecting an appreciable revenue from the export of castor seed and grams. The inspection barriers established on main export routes served their purpose with efficiency during the year. One of the main functions of the Machakos Inspection Service was wattle export and during the export season 2,130 tons of bark were dealt with. In the Coast Province the Marketing Officer was withdrawn during the year because the quantity of scheduled controlled produce was insufficient to support his post. The standard of inspection of the cotton crop greatly improved during the year. This is a service subsidized by the Cotton Sales Fund and backed by a cess which remunerates the African District Councils. Inspection services were also maintained on cashew nuts, copra, kapok and wattle bark. In the Voi District further progress was made with the organization of produce inspection and marketing and all scheduled produce underwent regular inspection at the main centres of Voi, Mwatate and Taveta.

CO-OPERATION

As production increases under the plans for intensified farming and improved marketing, there is an increased need for the development of producers' co-operative societies. The staff of the Co-operative Department is giving this close attention and provision under the Swynnerton Plan quadruples the establishment of Co-operative Officers and more than doubles the number of Inspectors. The progress in co-operative marketing being brought about by the Registrar of Co-operative Societies and his staff is greatly welcomed.

In the Nyanza Province Maize Co-operative Societies continued to flourish in North Nyanza. One new society was registered during the year bringing the total to three Unions and 40 Farmers' Co-operatives. There was a satisfactory increase in membership of these societies during the year. In 1954 they delivered 49,279 tons of maize to Produce Control, more than double the amount delivered in 1953. In South Nyanza seven Maize Co-operative Societies were organized attached to the Coffee Co-operative Societies for convenience. A Co-operative Transport Pool has also been organized in this district and will start operating in 1955. This pool will use 5-ton diesel lorries as well as the existing 3-ton petrol lorries belonging to the Coffee Union.

In the Central Province the expansion of coffee growing under the Swynnerton Plan has resulted in an increase in the number of Coffee Growers' Co-operative Societies. In Embu District there are now 11 such co-operative societies and one union. In Meru District there are nine such societies and one union and in Nyeri three coffee societies. In Kiambu District three coffee co-operative societies were started during the year. In the Kiambu District the co-operative movement continued to play a very important part in the marketing of the varied produce of the district in spite of the manifest inefficiency of the African staff who manage them. The turnover for the year of five pineapple societies amounted to £45,004. The 15 egg societies had a turnover of £4,819 and the eight vegetable societies a turnover of £3,750. Virtually 100 per cent of the export of eggs from the district was handled by these societies and 65 per cent of the pineapples.

With regard to pyrethrum the five societies in Kiambu marketed 160 tons of dried flowers worth £35,351. The three pyrethrum societies in Nyeri District had a successful year and the number of growers increased by nearly 100 per cent.

In the Rift Valley Province two co-operative societies have been formed for the marketing of wheat from Elgeyo and Nandi Districts.

In the Coast Province the coffee co-operative society in the Voi District had a successful year and is now preparing to take over the production of seedlings and the running of pest control teams. The Teita Vegetable Co-operative Society had some difficulty during the year in maintaining their contracts to Mombasa.

GRADING AND INSPECTION SERVICES, MOMBASA

Inspection.—The number of packages of plants and plant products imported and inspected at Mombasa decreased from 753,265 in 1953 to 340,267 in 1954. This was mainly due to discontinuation of maize imports. All other items showed an increase particularly fruit from Italy. There were two bulk shipments of Argentine wheat together valued at £433,000 during the year. The quantity of castor seed exported decreased to 218,229 bags compared with 321,025 bags in 1953. This reduction was mainly due to a decline in production from Uganda and the number of bags of known Kenya origin remained much the same as in the previous year and totalled 70,190 bags.

Phytopathological certificates issued amounted to 312 of which 219 were for coffee compared with 163 out of 182 in the previous year. One hundred and sixty of the certificates were for coffee exported to Egypt.

Grading.—The export of maize commenced in June, 1954, with a shipment of yellow maize but 19 per cent of the quantity railed proved to be unfit for export. In July the first of five shipments of approximately 10,000 tons each was made of Conditioned Undergrade Maize, the final shipment being made in January, 1955. Though the quantity of white haricot beans exported was well below the average of the last five years the quality was better and the percentage of F.A.Q. (i.e. third grade or better) rose from 53.9 per cent in 1953 to 91.6 per cent in 1954. No wheat was graded for export and due to the Emergency the potato trade remained disorganized with only sufficient supplies going forward for coastwise shipment. The export of chillies was average but there was a swing in origin from Uganda to Kenya and the quality rose from 38 per cent F.A.Q. in 1953 to 81 per cent in 1954. The new source of supply at Kwale rivals Mwatate in quality.

PRODUCE GRADED FOR EXPORT (BAGS), 1954

	Maize	Beans	Wheat	Potatoes
K.1	—	1,110	1,570	—
K.2	—	5,751	514	12,197
K.3	—	30,786	805	—
K.4	—	3,472	9	—
Undergrade	—	616	200	—
K.8 Y... .. .	21,057	—	—	—
K.8 Y. S ₂ W	19,024	—	—	—
K.8C	411,700	—	—	—
K.8Y.C.	33,337	—	—	—
Uganda	155,869	—	—	—
Total Graded	640,987	41,725	3,098	12,197
Rejected	8,215	—	—	584
Weevil infested	5,945	—	—	—
Wet	172	—	—	—
TOTAL, 1954	655,319	41,725	3,098	12,781
TOTAL, 1953	89,994	57,741	15,678	30,190

Figures for chillies graded are given below and compare with the total of 41,750 bags exported in 1953. The main market for East African *Capsicum annum* was Ceylon.

CHILLIES GRADED FOR EXPORT (BAGS), 1954

					Capsicum Minimum	Capsicum Annum	Total
G.A.Q.	..	..	..	..	26	—	26
F.A.Q.	..	..	..	..	1,031	23,302	24,333
Undergrade	..	..	..	..	5,307	4,887	10,194
TOTAL, 1954					6,364	26,189	32,553
TOTAL, 1953					5,086	36,664	41,750

Conditioning.—In the first half of the year there were only two large consignments treated at the plant. A consignment of wet Uganda maize was treated and completed by early March. The plant was then idle until the middle of May when a start was made on conditioning maize from Kitale for export. From July onwards the plant was operated fairly continuously with never more than an interval of a fortnight between consignments.

PRODUCE CONDITIONED (BAGS), 1954.

					1953	1954
Maize	..	..	..	..	145,551	255,556
Beans	..	..	..	..	13,333	10,046
Gram	..	..	..	..	2,391	337
Wheat	..	..	..	..	1,505	—
Other	..	..	..	..	2,292	—
Total					165,072	265,949

The plant was operated for a total of 4,102 hours during the year, compared with 2,547 hours in 1953.

Fumigation.—Though the use of BHC in packing seed beans has rendered fumigation unnecessary, there is still a great demand for this service for other produce, particularly for groundnuts. A total of 17,374 bags of all types of produce was treated in 111 operations, compared with 12,831 bags in 73 operations in 1953.

Finance.—The total quantity of produce graded was above the average mainly due to maize and the grading service made a profit during the year of £350. The conditioning plant made a considerable profit on the year's operations owing to an increase in the scale charges to conform with Maize Control plants and the above average quantity of produce treated. The year closed with the combined grading and conditioning service £7,522 in credit.

PART IV—GENERAL

Library

Only some 125 books were added to the Library during the year; like last year, this was again partly due to the ever increasing cost of publications. Some 2,500 publications were circulated to members of the Department and the public, in addition to those sent to out-stations for retention. Although visits and inquiries from farmers continued to decrease, due to the Emergency, 18 new depositors in the library were registered. A second binder was engaged during the year, and it was possible to start binding periodicals for out-stations; it is hoped that in time journals for all the main stations will be bound. As last year, four issues of the departmental newsletter appeared. The exchange scheme, started in 1953, continued to work well. It was satisfactory to note from handing-over reports that out-stations are being much more careful with their books, and only a very few publications were found missing.

Publications

The following Government publication was issued in 1954:—

Swynnerton, R. J. M.—A Plan to Intensify the Development of African Agriculture in Kenya, Government Printer, Nairobi.

The following is a list of articles by departmental officers published during the year:—

Beckley, V. A., and Hopkins, J.—The Determination of Pyrethrum I. *Soap and Sanitary Chemicals*, January, 1954.

Bellis, E.—Fertilizers as a factor in Food Production in Kenya. Paper presented to the Conference on Medical, Agricultural and Veterinary Aspects of Food Production in East Africa.

——— Review of Fertilizer Responses in Kenya.

——— Paper presented to the 5th International Congress of Soil Science at Leopoldville.

Birch, W. R.—Species for Leys in High Altitude Areas. *R.A.S.K. Journal*, 2, 23.

Bogdan, A.—Bush-clearing and Grazing Trial at Kisokon, Kenya. *East African Agricultural Journal*, 19, 253.

Dougall, H. W.—Effects of Ammonium and Nitrate Nitrogen on a Temporary Molasses Grass Pasture. *East African Agricultural Journal*, 19, 261.

——— Kikuyu Grass II.—An attempt to Improve a worn-out Pasture. *Ibid.* 19, 213.

——— The Chemical Composition of three Weeds in the Kenya Highlands. *Ibid.* 19, 152.

——— Fertilizer Experiments in Grasslands in the Kenya Highlands. *Ibid.* 19, 171.

——— The Composition of Green Oats for Forage and Ensilage. *Ibid.* 20, 119.

——— Some Fertilizer Aspects of Grassland Husbandry in the Kenya Highlands. *Journal British Grass. Society*, 9, 141.

Duff, A. D. S.—Seedling Resistance and mature-plant susceptibility of wheat to *Puccinia graminis* found in Kenya. *Nature*, 173, 779.

——— A new Disease of Wheat in Kenya caused by a species of *Pyrenophora*. *East African Agricultural Journal*, 19, 225.

——— Resistance to "Take-all" Disease in Kenya Wheat. *Ibid.* 20, 120.

- Jones, P. A.—Transplanting and Establishment of Coffee. *Coffee Board Bulletin of Kenya*, 19, 30.
- Le Pelley, R. and Kockum, S.—Experiments in the use of Insecticides for the Protection of Grain in Storage. *Bull. Ent. Res.*, 45, 295.
- Lerche, K.—Planting Material and Planting Methods. *Kenya Sisal Board Bulletin*. No. 10, p. 22; October, 1954.
- Melville, A. R.—The New Coffee Factory on the Coffee Demonstration Farm. Rukera Estate, Ruiru. *Coffee Board Bulletin of Kenya*, 19, 33.
- Nattrass, R. H.—Note on *Puccinia Polysora* Rust of Maize in Kenya. *East African Agricultural Journal*, 19, 260.
- Pereira, H. C. and Jones, P. A.—Field Responses by Kenya Coffee to Fertilizers. Manures and Mulches. *Emp. Journal Exp. Agric.*, 22, 23.
- Robinson, J. B. D.—A note on Sulphate of Ammonia application to Coffee. *Coffee Board Bulletin of Kenya*, 19, 58.
- Report on the Progress made with Chemical Control of Weeds in Coffee. *Ibid.* 19, 204.
- Rayner, R. W.—The Control of Coffee Leaf Rust. *Ibid.* 19, 40.
- Staff of the Coffee Research Station, Ruiru.—Irrigation of Coffee: A Review of current practice. *Ibid.* 19, 277.
- Strange, R.—Species for Leys in Medium Altitude Areas of Kenya. *R.A.S.K. Journal*, 2, 13.
- Ley Establishment at Medium Altitudes. *Ibid.* 4, 13.
- The production and handling of Herbage seeds. *Ibid.* 3, 18.
- Thorpe, H. C.—Cereals for 1954–55. *K.I.O. Fortnightly* Nos. 268–70.
- Note on the naming of Kenya Farmer's Wheat. *Canadian Journal of Agric. Science*, 34, 544.
- Walker, P. T.—Army Worm. *Kenya Weekly News*, 21.1.54 and *E.A. Standard*, 26.2.54.
- Webster, C. C.—Land utilisation and Soil Fertility maintenance in Kenya: A Review of Research in progress. *Proc. C.C.T.A. Soil Conference*, Leopoldville, 1954.
- The Ley and Soil Fertility in Britain and Kenya. *East African Agricultural Journal*, 20, 71.
- The present programme of Agronomic Research on Sisal. *Kenya Sisal Board Bulletin*, 8, 11.
- Progress Report on Grassland Research: *R.A.S.K. Journal*, 1, 23.
- Webster, C. C. and Lerche, K.—Soil Cover in Sisal Plantations. *Kenya Sisal Board Bulletin*, 7, 7.

Agricultural Legislation

The following comprise the more important legislative changes affecting agriculture during 1954:—

The Coffee (Marketing) (Amendment) Ordinance, 1954.—Provides for an export duty of $12\frac{1}{2}$ per cent on coffee exported from the Colony.

The Cotton Lint and Seed Marketing Ordinance, 1954.—This Ordinance regularises the method of marketing and disposal of cotton lint and cotton seed, replacing Defence Regulations, and establishes a Board to be known as the Cotton Lint and Seed Marketing Board.

The Flax Fund Ordinance, 1954.—Repeals the Flax Ordinance and the Flax (Temporary Suspension) Ordinance 1950, and provides for the application of the Flax Levy Fund and the Flax Account hereafter to be known as the Flax Fund.

The Maize and Sorghum (Imposition of Cess) Ordinance, 1954.—Provides for the establishment and composition of a Maize Price Equalisation Fund and for the application of the Fund. It empowers the Minister by order published in the Gazette to impose a cess on maize and sorghum prior to the commencement of each harvest after consultation with such bodies of persons as appear to him to represent the interest of maize and sorghum producers.

The Tea (Amendment) Ordinance, 1954.—Prescribes the uses to which any money accruing to the Board may be applied.

The Wheat (Agency) Rules, 1954.—Enacted under the Wheat Industry Ordinance, these Rules revoke the Wheat (Sale) (Agency) Rules (appearing at page 2831 of Volume VII of the Laws of Kenya). They provide for Returns to be submitted by growers to the Agency, and prohibit the sale or disposal of wheat in grain except with the written authority of the Member. The Rules also cover the certification of weight and grade; disposal of undergrade or rejected wheat. Agency's commission, payments to growers; disposal of cesses, fees and changes.

The Wheat (Import and Export) Rules, 1954.—Enacted under the Wheat Industry Ordinance, these Rules regulate the import and export of wheat, flour or wheatfeed.

Other legislation enacted during the year was as follows:—

Ordinances.—The Coffee Industry (Amendment) Ordinance, 1954; The Pig Industry Ordinance; The Wheat Industry (Amendment) Ordinance.

Rules and Regulations.—The Cotton Industry Ordinance: The Cotton (Amendment) Rules (Ginning Licence); Defence (Controlled Produce) Regulations: Prices and prohibition of movement orders. Defence (Control of Maize) Regulations: Prices and prohibition of movement orders. The Crop Production and Livestock Ordinance: Cashew Nut Marketing Rules (buying dates); Native Lands Coffee (Amendment) Rules (Substitute to First Schedule). The Wattle Bark (Improvement) and Inspection Rules (Amendment to Schedule). The Export Duty (Hides and Skins) (Variation of Duty) Order. The Increased Production of Crop Ordinance: F.O.R. prices scheduled crops; Guaranteed minimum Returns; The Land and Agricultural Bank Regulations 1954 (fees payable in respect of application for an advance). Plant Protection Rules: dates between which the planting of maize and sorghum is prohibited. Native Lands Trust (Emali-Lower Makueni) Grazing Rules. The Resident Labourers Ordinance: The Resident Labourers (Nyanza District Council) (Amendment) Order (Movement of Cattle). The Sisal Industry Ordinance: The Sisal Industry (Inspection) (Amendment) Rules (sub-rule (3) of rule 4 and rule 6 of the Main Rules revoked); Cess of Sh. 15 on each ton of sisal or part of a ton. The Wheat Industry Ordinance: The Wheat (Allocation) Rules, 1954 (Allocation formula determining the quantity of wheat to be allocated in respect of mills): The Wheat Board (Procedure) Rules 1954.

Staff

Mr. R. E. T. Hobbs, Deputy Director, proceeded on leave pending retirement in March after 22 years in the Department. Mr. R. J. M. Swynnerton was promoted to fill the vacancy and Mr. B. C. Wills arrived at the end of October from Northern Rhodesia as Assistant Director (Field Services). Mr. Swynnerton acted for the Director in his absence on leave from the end of June to the end of October. Mr. L. H. Brown and Mr. A. Storrar were promoted to be Assistant

Directors (Field) in charge of Provinces. Four newly-trained Agricultural Officers, Messrs. G. C. H. Hill, J. R. Peberdy, M. E. H. Vickers and P. S. Thiongo Mirie arrived to augment the establishment of the field services while a further four Agricultural Officers in training are expected to arrive in August, 1955. New indents to implement the Troup Report and the Swynnerton Plan raised the outstanding indents with the Colonial Office to 39 and by the end of the year notification had been received that 15 posts had been filled of whom some would arrive in 1955 but the majority would not complete their training under the Colonial Office until mid-1956. At the end of the year the post of Chief Agriculturist had not been filled nor was that of one Assistant Director (Field) upgraded under Sessional Paper No. 17 of 1954.

RECRUITMENT OF QUALIFIED STAFF AS AT 31ST DECEMBER, 1954

					<i>Posts Filled but not Arrived</i>	<i>Posts Unfilled</i>	<i>Total</i>
Chief Agriculturist	..	..	..	—	1	1	
Assistant Director (Field)	..	..	..	—	1	1	
Agricultural Officer (10 Research, 15 Field)	..	..	..	10	15	25	
Pasture Research Officer	..	..	..	4	—	4	
Plant Breeder	..	..	..	2	—	2	
Entomologist	..	..	..	1	—	1	
Soil Chemist	..	..	..	1	—	1	
Soil Surveyor	..	..	..	1	—	1	
Statistician	..	..	..	—	1	1	
Plant Pathologist	..	..	..	—	1	1	
Soil Conservation Engineer	..	..	..	—	1	1	
				19	20	39	

Recruitment of Assistant Agricultural Officers, Assistant Soil Conservation Officers and Assistant Surveyors to fill 57 vacancies caused by wastage and the implementation of the Troup Report and the Swynnerton Plan has been extremely sluggish. From the 1st April until the end of the year local advertisement had only produced five suitable candidates while 15 posts had been filled by the Crown Agents from the United Kingdom, leaving 37 unfilled vacancies at the end of the year. As a further 29 vacancies for Assistant Agricultural Officers will occur on the 1st July, 1955, under the phasing of the Swynnerton Plan, the prospect of securing 66 officers of these categories in addition to any wastage in 1955 are dismal and are little improved by the revised salaries of the Lidbury Report, particularly the basic scale for local recruitment which is the category which we most desire to attract. This is likely to retard the agricultural development plans.

So far as African Staff was concerned, Mr. P. S. Thiongo Mirie was the first qualified Agricultural Officer to join the Department after graduate and post-graduate training in the United Kingdom. No candidates from Makerere College were forthcoming although there are at last a number in training for agriculture. Recruitment of Agriculture Instructors having sufficient educational qualifications

was again difficult in all Provinces except Central where the Emergency has obliged the Kikuyu to seek employment within the Province, advantage of which has been taken in recruiting Instructors and Assistant Surveyors of the K.A.S.S.E. and School Certificate Standard for training.

The establishment of the Department is set out below as graded by the Lidbury Salaries Review and amended by Sessional Paper No. 17 of 1954.

	<i>Administrative Headquarters</i>	<i>Field Services</i>	<i>Research Services</i>	<i>Total</i>
Superscale Posts	3	7	5	15
<i>Technical Staff</i>				
Scale A (Agricultural Officers and Specialists)	—	50	48	98
Scale C (Assistant Agricultural Officers, Laboratory Tech- nologists etc.)	—	209	63	272
Scale D (Training)	—	—	4	4
Scale E (Instructors, Levellers, Laboratory Assistants, Tractor Drivers)	—	1,200	138	1,338
<i>Administrative, Clerical, Accounting and Artisan Staff</i>				
Scale B	4	—	—	4
Scale E-C (including Vehicle Drivers)	27	166	96	289
	34	1,632	354	2,020

The main effect of the Lidbury Salaries Report, as modified by Sessional Paper No. 17 of 1954 and approved by the Legislature, has been to improve the prospects of the able officer rather than to effect large salary increases for the professional and technical officer in the A and C scales, although their increases are less modest than appears at first sight if hidden factors such as improved pensions resulting on consolidation into salaries of a substantial part of the cost of living allowance, reduced house rent or shorter tours are taken into account. The substantial increases which were effected were at the superscale level and in the E Scale with promotion prospects into the C Scale at a level which greatly benefited the bulk of the African staff. The recommendations whereby advancement prospects for able officers were improved were:—

1. The Lidbury Report graded the Chief Research Officer at £2,000 while Sessional Paper No. 17 advanced this post and that of Chief Agriculturalist to £2,200.
2. The Lidbury grading of £1,740 x 60—£1,860 for Senior Research Officers was, for the present incumbents, raised by Sessional Paper No. 27 to £2,000.
3. The Lidbury Report omitted to grade Provincial Agricultural Officers. Three superscale posts created in 1954 were redesignated by the Sessional Paper, Assistant Director (Field) at the £2,000 level with effect

from the 1st January, 1954. Two Agricultural Officers posts were upgraded to Provisional Agricultural Officer on the scale £1,740 x 60—£1,860 to come into effect on the 1st January, 1955, thereby covering the five agricultural Provinces of Kenya.

4. The recommendation of the Lidbury Report that an extension above Scale A, £1,674 x 54—£1,836, known as the "medical/scientific extension", should apply to personally selected specialist officers was accepted by Government.
5. The Sessional Paper provided a promotion grade to C2 for up to 10 per cent of Assistant Agricultural Officers on the grade C5—C3 on ability and merit on reaching the maximum of C3 and a number of Senior Laboratory Technologist posts were similarly created.
6. Posts for Accountant on the B1 grade and for Establishment Officer on B4—B3 were approved.
7. The Lidbury Report left large sections of the clerical and junior technical categories of the Civil Service to be graded by teams appointed by Government. After a process of grading and regrading, it is considered that a satisfactory pyramid of advancement has resulted from the negotiations, e.g. of promotion to Section Officer into the clerical service or to Senior Field Assistant (C6—5) for Instructors and Levellers, now redesignated "Field Assistant".

The Emergency has continued to make the year a difficult one and once again I wish to thank all members of the staff for their loyalty and the good work they have put in under trying conditions of staff shortage at a time of expanding development. This particularly applies to those in the Central and Rift Valley Provinces who have carried a greatly increased burden under the operation of the Kikuyu relief schemes often in areas of considerable danger.

Nairobi,

19th March, 1955.

G. M. RODDAN,

Director of Agriculture.

